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Malayan Agricultural Journal.

JANUARY, 1934.

EDITORIAL.

Organic Matter and Nitrogen in Malayan Soils.

The article by R. G. H. Wilshaw on organic matter and nitrogen in Malayan soils, which is included in this issue, forms Part III of the series of Studies in Malayan Soils. Part I of the series was published in the August 1933 number of this Journal and discussed the classification and properties of Malayan soils, while Part II, which appeared in October of the same year, dealt with problems of manuring of inland soils.

The present paper describes experiments which have been carried out to ascertain to what extent the accepted views on the carbon and nitrogen cycles, which take place in soils, can be applied under conditions obtaining in Malaya. The necessity for the proper understanding of the functions of these two elements is obvious, seeing that carbon is primarily concerned with the formation of plant tissue and nitrogen with processes of growth.

Malayan inland soils of the quartzite or granite type are normally deficient in organic matter, which tends to accumulate in soils in which the activity of micro-organisms is curtailed. In Malaya, in general, conditions are ideal for the rapid and complete decomposition of soil organic matter into carbon dioxide, water and simple inorganic nitrogen compounds, and in the soil, practically no formation of what is called "humus" occurs. As a result of the addition of organic matter in the form of green manures, however, there is a rapid production of ammoniacal and nitrate nitrogen which is absorbed by growing plants with a resultant stimulation of growth.

One conclusion of very great practical value which emerges from this paper must be mentioned. The author concludes that, contrary to the view usually held, plants thrive best if green matter is turned in *shortly before planting*. The turning in of a green manure some time before planting results, under the tropical conditions obtaining in Malaya, in the liberation of ammoniacal nitrogen, which under fallow conditions is lost; whereas, under non-fallow conditions, this ammoniacal nitrogen is rapidly changed to nitrate nitrogen and hence is of immediate benefit to the plant which is then at an early stage of growth and therefore likely to respond readily to this supply of plant food.

There are many questions connected with organic matter in soils and the behaviour of green manures, as well as problems relating to the nitrogen cycle particularly under field conditions, which remain unsettled. The article indicates the lines on which future work will be directed as a result of the observations made to-date during the course of the experiments on these complex problems.

The Oil Palm in Sumatra.

In May 1933, Mr. J. N. Milsum of the Department of Agriculture S.S. and F.M.S. visited the east coast of Sumatra with the object of studying the recent advances in connexion with the oil palm industry in that country.

The article entitled "The Oil Palm in Sumatra", which is published in the present number of the Journal, gives an outline of some of the more important points of interest observed during his visit, and should form a useful supplement to the information contained in the new edition of the Manual on Oil Palms in Malaya which is about to be published by the Department of Agriculture S.S. and F.M.S.

There is an area of some 155,000 acres under oil palm cultivation in Sumatra, and during the past fifteen years, the area under oil palms in Malaya has increased considerably—from 225 acres in 1917 to 61,000 acres in 1933.

The methods of cultivation adopted appear, on the whole, to be similar in both countries and it is interesting to note that in Sumatra, as in Malaya, the question of manuring with artificial fertilisers is receiving considerable attention. In this connexion, the practice in Sumatra of growing a trial crop of maize on an experimental plot, with the object of assessing the phosphatic requirements of the soil in an area, merits attention.

The importance of using seed of known parentage when planting new areas of oil palms is now well recognised; in Sumatra, where this has been an established practice for a longer period than in Malaya, the results to-date are stated to have justified the care taken in this matter.

Mushroom Culture.

The growing of mushrooms is an established industry in many parts of the world, particularly in England, France and America where a species of edible fungus (*Agaricus campestris*) is cultivated on a large scale and finds a ready market. This mushroom also grows wild in the fields during the autumn months, especially following a warm summer, and is much appreciated as an article of diet. In Malaya a species of Agaricus, closely related to *A. campestris,* appears mainly during the months of August and September. This species is well known to European residents in Selangor since it grows on the fairways of the golf course at Kuala Lumpur.

In Europe and America, mushrooms are cultivated in especially constructed houses, or in caves, underground passages, or disused barns, as well as in the open air. Considerable trouble is taken in the preparation of the compost of

which the beds are made. This compost is composed of manure, preferably horse manure, with the addition of straw and soil, and spawn is not added until suitable conditions of temperature and moisture are obtained. The preparation of the compost and the care of the beds requires skill and experience, if remunerative crops are to be secured.

Mushrooms are also grown in China and Japan and are exported mainly in dried form; the species most commonly imported into Malaya is not *Agaricus campestris,* but belongs to a related family—Volvariaceae—and is called *Volvaria volvaceae.*

This species is comparatively rare in the temperate zones and usually grows in hot houses or on beds of tanning bark and similar substrata. It is not, so far as is known, looked upon as an edible fungus in these regions, but in the Eastern tropics it is highly prized by Europeans and Asiatics and considered a delicacy.

In 1916, A. S. Vicencio published a paper, in *The Philippine Agriculturist and Forester,* on mushroom culture (Volvaria) in the Philippines. This was followed in 1921 by a paper by O. A. Reinking and W. H. Brown in a Bulletin of the Bureau of Forestry. A more recent paper by C. van Overeem, in the *Bulletin du Jardin Botanique* 1927—1928, gives an interesting account of the methods employed by the natives in Netherlands India, in the cultivation of Volvaria on rice straw.

Attempts to grow the mushroom *Agaricus campestris* in Malaya from spawn imported from England and Australia have, so far as is known, not met with success, at any rate on the plains. This, however, is only to be expected in view of published statements that the optimum temperature for mushroom beds of this species is 50° to 56° F., the working limits being to 50° to 65° F., and that spawned beds are rendered useless by heating to 72°F. or more for brief periods. A temperature of 72° F. maintained for 24 hours is injurious to spawn, and although the mycelium of the fungus will grow in pure culture up to a temperature of 85° F., a high temperature in the beds encourages other organisms which suppress the growth of mushroom mycelium. It appears probable that, if success in the cultivation of mushrooms is to be obtained in Malaya, a species which will grow in this country should be used, and in this connexion an interesting article by Mr. J. A. Baker is published in the present number of this Journal.

The article describes an experiment in the cultivation of *Volvaria volvaceae* on padi straw at the Bukit Merah Padi Test Station in Province Wellesley, where the success obtained warrants the conclusion that it is probable that mushroom growing would form a profitable accessory industry to padi cultivation.

Original Articles.

STUDIES IN MALAYAN SOILS. PART III

BY

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Agricultural Field Officer,

(formerly Assistant Soils Chemist).

In Parts I and II of this series, a general account of the characteristics of Malayan soils and the reactions of these to manuring has been given. This paper gives a short account of the accepted views on carbon and nitrogen changes which take place in soils, and describes experiments which have been carried out to ascertain their applicability under Malayan conditions.

Carbon and nitrogen changes which take place in soils are often referred to as cycles. The carbon cycle is concerned with the building up of plant tissues from the carbon dioxide of the air and the decomposition of these tissues under the influence of micro-organisms with the liberation of carbon dioxide again. Similarly, the nitrogen cycle is concerned with the absorption and fixation of nitrogen by plants and micro-organisms and the changes accompanying decomposition. In that carbon may be regarded as the primary element concerned with the formation of tissue, and nitrogen with progress of growth, these two elements merit special study.

This paper concludes with a summary of the position reached with reference to these changes, together with mention of the lines along which future work will be directed.

Short Summary of the accepted views on Carbon and Nitrogen changes in Soils.*

The cycle of nitrogen and carbon changes which take place in soils is dependent on the organic material present.

The organic matter of the soil is a dynamic constituent representing the balance of accumulative over destructive agencies; that is to say, it represents the difference between the rate of addition of plant residues being incorporated with the soil and the destruction of these residues which is being carried out by a variety of micro-organisms. In itself, moreover, it is the source of its own destruction in that it supports this varied microbiological life.

Organic matter accumulates in soils where conditions tend to be anaerobic and temperature low, that is, under conditions where microbiological life is curtailed. Under aerobic conditions and higher temperatures, microbiological

*The following summary has been freely adapted from 'Soil Conditions and Plant Growth'—E. J. Russell, 1932 Edition.

life increases and decomposition of the organic material proceeds at a higher rate. Under stable conditions, an equilibrium may be reached where decomposition balances accumulation.

The decomposition of plant materials is primarily an oxidation by soil micro-organisms, oxygen being absorbed and carbon dioxide liberated, and is in fact the direct reversal of the process which went on when the plant was originally built up from the carbon dioxide of the air by means of chlorophy. This oxidation process, however, is not complete and a residue is left which in combination with various products, re-synthesised by the micro-organisms in building up their own body substances, gives rise to what is termed humus. Humus, together with the remains of plant material in various stages of decomposition, constitutes soil organic matter.

In this oxidation process, organic substances which have the lowest carbon content such as sugar, starch and cellulose, tend to disappear first, and carbon altogether disappears more quickly than nitrogen: the resultant material in temperate climates usually has a carbon nitrogen ratio of about 10 or 12 to 1.

The micro-organisms which bring these changes about derive their energy for growth from the carbohydrates present, but in order to build up their own body substances, they convert the plant proteins into microbial proteins. If there is any excess nitrogen above that required for their own needs, this is liberated in the form of nitrate. It has been found that one part of nitrogen is immobilised for every 13 to 18 parts of carbon when the soil is acid. If there is any excess of nitrogen in the original material above this amount, it will be liberated as nitrate. If carbon is present in a greater ratio than 12 to 1 to the nitrogen, all the nitrogen present is utilised by the micro-organisms for their own purposes (in the soil they will draw upon any reserves of nitrate that may exist) and the excess carbon is given off as carbon dioxide. Thus, the carbon nitrogen ratio always tends to come back to a fixed value.

Various attempts have been made to follow the course of the decomposition of plant material and the adjoined table shows the general result of the various reactions.

Comparison of Plant Materials with Soil organic matter (Waksman and Tenney).

		Plant Material	Soil organic Matter
Celluloses	...	24.40	3 — 5
Hemicelluloses	...	15.25	5 — 8
Lignin	...	10.30	40 — 50
Protein	...	2.10	30 — 35
Water soluble Protein	...	15.3	Nil

These figures and modern views indicate that, in general, organic material is broken down by means of the rapid decomposition of cellulose and hemicellulose, and that lignin is not decomposed but is altered and exists in close association with synthesised proteins.

The final transient but relatively stable product humus has been the subject of much research and it has been found that humus may be split into a number of distinct fractions by treatment with acid and alkali. Reference is made in the experiments to be described later to two such fractions known as alpha and beta humus. These are obtained by differential treatment of an alkaline extract of soil with hydrochloric acid.

All the micro-organisms active in the soil are dependent upon the organic material present, but some of these organisms have specific actions and their activities are associated with a particular compound or compounds.

In general, it may be stated that practically all bacteria and fungi will decompose sugars and starches. The decomposition of cellulose, however, is different: under acid conditions (pH4 or less) it is limited to fungi: above this, from pH 5.5 to 7.0, bacteria are active: under anaerobic conditions decomposition is confined to clostridia.

There are numerous micro-organisms capable of oxidising specific organic compounds which occur in the soil and whilst these are of importance in themselves in that they prevent the accumulation of toxic products, their mention must suffice for the purposes of this account.

Changes which occur in the nitrogen and the micro-organisms associated with these compounds are, however, of great importance. The nitrogen compounds in plant residues added to the soil, break down to form ammonia so long as the ratio of C/N does not exceed 10:1. This change is brought about by various organisms, chiefly *B. Mycoides*, *B. subtilis*, *Ps. fluorescens* and *Ps. candatus* and probably enzymes are partly responsible. The ammonia thus produced is changed rapidly into nitrite by the bacteria Nitrosomonas and Nitrosococcus and again rapidly into nitrate by Nitrobacter.

In addition to this change in the form of nitrogen, reverse changes and loss of nitrogen may occur from soils due to denitrification. The conditions necessary are absence of oxygen, the presence of easily oxidisable organic matter, and a reaction between pH 6.4—8.4. The action can be brought about by a large number of micro-organisms.

Happily for agriculture, however, there are various microbiological activities which increase the amount of nitrogen in soils. This increase is obtained from the nitrogen of the air and fixation is brought about by either Clostridia and Azotobacter, free living organisms, or *Bacillus radicicola,* an organism living in symbiosis with leguminous plants.

The total nitrogen content of any soil is, therefore, the balance which exists between these various processes.

It must be remembered that the above views are those which are held in relation to soils of temperate climates. Attention will be drawn in the final remarks of this article to the modifications which must be accepted when applied to the soils of the humid tropics such as Malaya.

Experimental work on Malayan Soils.

The experiments carried out on Malayan soils fall into well defined groups and will be described under the following headings.

I. Pot Experiments on Rates of Nitrification.

II. Loss of Nitrogen by Leaching from Pots treated with Green Cover Crops. The Effect of Azotobacter Innoculation.

III. Decomposition of *Crotalaria usarmoensis* in Pots at normal and sub-normal temperatures. Formation of humus.

IV. Organic Matter Decomposition. Turning in of Fresh Green Covers in the Field.

V. Experiments on the Effect of Turning in of Green Manures on Plant Growth.

Pot Experiments on Rates of Nitrification of Fertilisers.

First Series. A series of pots, each containing 6 kgs. of Raub High Level soil, were set up on 21.4.32. These pots were treated in duplicate with the following fertilisers:—(1) Ammonium phosphate, (2) Urea, (3) Ammonium sulphate, (4) Cyanamide, (5) Cow manure, (6) Control: 120 mg. of nitrogen was added in these forms to each pot, equivalent to a dressing of 40 lbs. of nitrogen per acre.

The pots were kept bare and leaching was carried out at irregular intervals at the rate of 40 c.c. per leaching over a period of thirty-five days.

At the end of this period, figures for the total leachings indicated that nitrification of the added fertilisers was just starting in most of the pots.

The pots treated with ammonium phosphate had given off most nitrate nitrogen in the leachings, 36 mg. compared with control pots 15 mg. This corresponds to 17.5 per cent. nitrification of the added fertiliser. Pots treated with cyanamide and cow manure appeared to have the slowest rate of nitrification.

Ammoniacal nitrogen in the leachings was low, practically negligible, ammonium phosphate pots having given off the highest amount, (1.0 mg.) and control the lowest (0.5 mg.).

When the pots were dismantled and the soil analysed, nitrate nitrogen was highest in the ammonium phosphate, sulphate and urea pots. Ammonia was similar in all.

Second Series. A series of pots was set up on 1.6.32 with similar fertilisers as in Series 1, but Castor cake was also included. Double dressings of fertilisers were given to all pots (240 mg. N_2* per pot) and heavier leaching was carried

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*In order to save space, the symbols or formulae N_2, NO_3 and NH_3 are used for nitrogen, nitrate and ammonia respectively.

out. Leaching was at the rate of about 1000 c.c. per pot every three days for the first 2½ months; subsequently, leaching was carried out once a week only.

Position at end of 44 days.

Leaching of N_2 as nitrate. Controls were lowest, giving off 174 mg. N_2, ammonium sulphate was highest yielding 276 mg. This is an increase of 102 out of 240 mg. added = 42.5 per cent. nitrification.

Castor cake, urea and ammonium phosphate had all liberated about 230 to 240 mg., cow manure and cyanamide about 200 to 210 mg.

Leaching of N_2 as ammonia. Considerable quantities of N_2 in this form were leached out. Controls gave off least, about 25 mg. per pot, varying to ammonium sulphate, the highest, 85 mg. per pot. The loss of N_2 as NH_3 from the control pots corresponds to a loss of 64 lbs. per acre per year.

Total leachings of N_2 (as NH_3 and NO_3) in the ammonium sulphate pots accounts for $102 + 60 = 162$ out of 240 mg. of added $N_2 = 68$ per cent.

Position at the end of 5 months.

These pots were leached continually over a period of five months and finally dismantled on 13.1.33. During this period the N_2 as NH_3 sank practically to nil in the leachings in all cases, whilst the N_2 as NO_3 remained the same for all pots. Over this period the treated pots lost 140 to 150 mg. N_2 as NO_3 as against the control pots about 100 mgs.

Most of the effects, therefore, of the nitrogenous dressings were evidenced within the first period of forty-four days.

The experiment shows that under the existing conditions, nitrification hardly started until a month had elapsed and that eventually this proceeded slowly, with ammonium sulphate nitrifying at a higher rate than other manures.

It also suggests that, under fallow, unmanured conditions, losses amounting to as much as 420 lbs. per acre of N_2 as NO_3 and 60 lbs. per acre of N_2 as NH_3 may occur under heavy leaching conditions over the period of a year.

Third Series. Two series of pots were set up on 2.6.32. Each pot of one series contained 9 kgs. of jungle soil and each pot of the other series, 9 kgs. of an adjacent soil. Both soils were of the quartzite type, and had been lying fallow for some time. These soils were treated with ammonium sulphate, 360 mg. N_2 per pot, ($N = 80$ lbs. acre) and compared with controls.

Position at end of 42 days.

Leaching of N_2 as NO_3. At the end of this period, in the case of both soils, similar amounts of N_2 had been leached out of all pots, showing that, in this soil, nitrification had not started even after six weeks. Judging by the amount recovered from the control pots (100 mg. from 9 kgs. quartzite soil compared to 175 mg. from 6 kgs. of Raub High Level soil after the same time

in the previous experiments) the quartzite soil has a much lower rate of production of nitrate under normal conditions than Raub High Level soil.

Leaching of N_2 as NH_3. The N_2 leached out in this period shows a very great difference between controls and treated pots. The ammonium sulphate pots gave off 70—90 mg. against control of 8—16 mg.

This fact suggests, as in the previous experiments, that large quantities of nitrogen may be lost from nitrogenous fertilisers in the form of ammonium ion under fallow conditions on some soils in this country within a very short time, owing, apparently, to heavy leaching combined with a slow rate of nitrification and a low absorption capacity or retaining capacity of the soil colloids.

Position at the end of 6 months.

These leachings were continued until January, 1933, by the end of which time the total amounts of N_2 as NO_3 recovered in the leachings were as under.

		mgs.
Jungle soil + Ammonium sulphate	...	180
Jungle soil alone	...	170
Cleared soil + Ammonium sulphate	...	142
Cleared soil alone	...	150

On the other hand, the amount of N_2 as NH_3 recovered in the leachings was negligible—the value for all pots having fallen practically to nil at the end at the first six weeks and remaining there throughout.

As the difference in N_2 as NH_3 recovery at that time between controls and treated pots was 70 mg. and practically no further difference has been shown since, either in N as NH_3 or NO_3, it appears as if either 360—70 mg.—*i.e.* nearly 300 mg. of N_2 have been absorbed by the soil in some insoluble form, or else lost as gaseous nitrogen.

Loss of Nitrogen by Leaching from Pots Treated with Green Cover Crop (crotalaria usaramoensis) and Starch. The effect of Azotobacter Inoculation on Nitrogen Fixation.

A series of 24 pots was set up on 26.2.32, filled with 6 kgs. each of Raub High Level soil. Two series were arranged, limed and unlimed, half of each series being heavily inoculated with Azotobacter. Each series contained 12 pots of which four pots were treated with :—(*a*) cover crop—240 grams per pot equivalent to 40 tons per acre;—(*b*) four with starch—100 grams per pot (carbon to correspond to carbon in cover crop); (*c*) four controls.

These pots were leached weekly for the first five months, then fortnightly, at a rate of 600 c.c. of leachings per pot.

Loss of N_2 as NO_3 in Leachings. Up to a period of 20 weeks, the addition of starch depressed the leaching of N_2 completely in all cases. At the end of this period, a small amount was beginning to be recovered in the leachings.

Controls gave off a steady low amount, about 4 mg. per week on an average for the unlimed series and slightly higher for the limed series.

The pots, into which the cover had been turned, showed a sharp rise in the amounts leached out at the end of the fifth week. This was followed by a gradual decline until it reached the rate of the controls about the end of the seventh week.

The leachings from the limed plots were higher than from the unlimed.

At the end of seventeen weeks the position may be summarised as under:—

		mgs. of N_2 as NO_3 recovered in leachings		
		Limed	Unlimed	
Control	...	164	70	Inoculated
Cover	...	426	290	Inoculated
Starch	...	Nil	Nil	Inoculated
Control	...	116	67	Uninoculated
Cover	...	402	301	Uninoculated
Starch	...	Nil	Nil	Uninoculated

Loss of N_2 as NH_3 in Leachings. Over the period of twenty weeks, controls and starch-treated pots gave off a negligible amount of N_2.

In the case of the pots with covers turned in, there was a sharp rise at the end of the third week which gradually declined to a negligible amount again by the end of the eighth week.

This sudden ammonia production, most probably from the readily decomposable protein matter in the green tissue, is reflected in the high rate of production of N_2 as NO_3 which was observed starting at the end of the fifth week. As on previous occasions, the limed plots liberated a larger amount of N_2 as NH_3 than the unlimed. The effect of lime would appear to be one of stimulation of the population of micro-organisms. Whether it is to be attributed to the presence of calcium ion, depression of hydrogen ion, or neutralisation of acidic toxic products is not known.

Position after 41 weeks.

Loss of N_2 as NO_3 in Leachings. As mentioned above, towards the end of twenty weeks the starch-treated pots commenced to lose N_2 in the leachings. This continued until at the end of a further period of twenty-four weeks the rate was practically the same as that of the controls. Pots treated with crotalaria still had a higher output of N_2 than the others and the effect of lime still influenced the figures slightly. No effect was attributable to inoculation.

During the period from the seventh week until the forty-first week the losses may be tabulated as under:—

		mg. N_2 as NO_3		
		Limed	Unlimed	
Control	...	91	63	Inoculated
Cover	...	141	116	Inoculated
Starch	...	85	25	Inoculated
Control	...	70	48	Uninoculated
Cover	...	134	111	Uninoculated
Starch	...	75	40	Uninoculated

These in combination with the previous figures for losses give totals over a period of forty-one weeks from the start as under :—

		mg. N_2 as NO_3 Limed	Unlimed	
Control	...	302	189	Inoculated
Cover	...	646	515	
Starch	...	98	29	
Control	...	239	155	Uninoculated
Cover	...	660	514	
Starch	...	82	41	

Loss of N_2 as NH_3 in Leachings. Over the whole period from the seventeenth to forty-first week, the amounts recovered in the leachings were negligible, in all cases the total being about 1 mg. from any one pot.

Total Nitrogen content of the Soils.

The soils in these pots started with a total nitrogen content (Kejldahl) of 0.170 per cent. At the time of the first period of seventeen weeks this had dropped to 0.105 per cent.

For those pots containing 6 kgs. of soil, this corresponds to a total difference of 3900 mg. of nitrogen.

The amounts of nitrogen leached out in the form of ammonium salts and nitrates up to this time has a maximum value of less than 500 mg.

Periodic determinations of nitrogen by the Kejldahl method were carried out on the leachings and figures obtained show an average loss of about 5 mgs. of nitrogen and 50 mg. of carbon from control and cover crop pots over a period of fifty weeks. Some of the starch pots, however, gave figures showing twenty time this amount. This point requires further investigation, especially in view of the recent theory advanced by Vageler that, in non-calcareous tropical soils, nitrogen is lost as soluble humates.

Taking the maximum amount thus lost, however, the total nitrogen losses accounted for is scarcely 50 mg. There remains, therefore, 3400 mg. of nitrogen unaccounted for. The most likely explanation of this enormous loss is that it occurs in the form of gaseous nitrogen.

This theory seems tenable especially in view of figures obtained at the end of forty-one weeks. By this time, the total nitrogen content of the pots, whilst showing slight variation between themselves, gave an average value of 0.121 per cent., showing that nitrogen recuperation was setting in. It seems likely that the aeration given to the soils in filling the pots caused heavy destruction of the organic nitrogen compounds of this soil to proceed, and that now that the soil has settled in the pots, equilibrium is once more being brought about.

Loss of Nitrogen as NO_3 and NH_3 from Pots treated with Green Cover Crop and Starch, and carrying a growth of Grass.

In view of the large losses of nitrogen obtained in Experiment II, a further extension of this was started in September, 1932. In this case, no inoculation with Azotobacter was carried out, but the pots all carried a growth of grass. In other respects the lay-out was similar. The grass was cropped periodically and the nitrogen thus removed was determined.

The experiment consisted of 12 pots of Raub High Level soil from the Government Experimental Plantation, Serdang, each containing 6 kgs. of soil. Six of these received a dressing of lime. Cross dressings were cover crop turned in, starch turned in, and controls as in the previous experiment. The fresh cover contained 1.07 per cent. N_2.

Grass was planted on 27.9.32.

In the first leachings taken on 10.10.32, very large amounts of N_2 as NH_3 were recovered from the pots treated with the cover crop—100 mg. in the case of the limed soil and 60 mg. in the unlimed. Nitrates were low. These values for N_2 as NH_3 fell gradually to practically nil at the end of eight weeks whilst the N_2 as NO_3 gradually increased. During this period, control pots and starch pots, after a preliminary small amount of N_2 as NH_3, gave nil values for nitrogen as both NO_3 and NH_3.

At the end of fifteen weeks these conditions still obtained.

This shows quite clearly and definitely, therefore, that the presence of a growing cover enables all N_2 as NO_3 to be absorbed under normal conditions and that, although after a dressing of green manure there is such a rapid decomposition of readily soluble proteins that quantities of ammonia may escape by leachings, the crop soon reduces this excess. As was expected, the crops of grass reaped were best on the cover-treated pots and worst on the starch—the activities of the organisms in decomposing this rendering all nitrate unavailable for the growing plant.

The relative crops produced may be seen from a comparison of the N_2 figures for the grass-croped. The percentage N_2 in the grass was practically the same for all pots.

Total mg. N_2 recovered in crops at end of 15 weeks
(Averages)

		Limed	Unlimed
Control	...	180	122
Cover	...	660	650
Starch	...	94	80

mg. N_2 as NO_3 recovered in leachings.

		Limed	Unlimed
Control	...	16	11
Cover	...	78	65
Starch	...	Nil	Nil

mg. N_2 as NH_3 recovered in leachings.

		Limed	Unlimed
Control	...	16	16
Cover	...	153	140
Starch	...	3	3

The sudden rise and fall in ammonia figures and the manner in which nitrate is absorbed by the growing plant is best shewn by the following tables :—

mg. N_2 as NH_3 recovered in leachings.

Treatment	10/10.32	10/24.32	11/7.32	11/21.32	12/5.32	12/19.32	1/9.33
Control	11.5	1.1	0.3	0.3	0.4	Nil	0.2
Control	13.8	3.3	0.3	0.3	0.2	Nil	0.2
Cover	92.0	51.75	2.3	0.8	0.1	Nil	0.2
Cover	103.5	51.75	3.4	0.8	Nil	Nil	0.2
Starch	2.3	1.1	0.4	0.2	0.1	Nil	0.3
Starch	1.1	0.6	0.3	0.3	Nil	Nil	Nil

mg. N_2 as NO_3 recovered in leachings.

Treatment	10/10.32	10/24.32	11/7.32	11/21.32	12/5.32	12/19.32	1/9.33
Control	16.5	Nil	Nil	Nil	Nil	Nil	Nil
Control	16.5	3.3	Nil	Nil	Nil	Nil	Nil
Cover	2.8	20.7	20.7	20.7	6.7	5.6	Nil
Cover	2.8	13.8	20.7	20.7	11.1	9.2	Nil
Starch	Nil	0.5	Nil	Nil	Nil	Nil	Nil
Starch	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Decomposition of Crotalaria Usaramoensis in Pots at Normal and Sub-normal Temperatures. Formation of Humus.

On 31.3.32, 12 pots were set up, each containing 28 kgs. of Raub High Level soil. 560 gms. of fresh Crotalaria were turned in to each pot, corresponding to a field dressing of 20 tons per acre. 6 pots were limed at the rate

of 2 tons per acre—6 unlimed. 2 pots, one limed and one unlimed, were set aside under normal temperature conditions and kept water-logged.

2 limed and 2 unlimed pots were placed in a 'cold storage' box at an average temperature of 75°F—the remaining pots were exposed in the open.

All the pots (excepting those water-logged) were leached weekly to about 600 c.c. and N_2 as NH_3 and NO_3 determined in the leachings. The fresh cover turned in contained 1.2 per cent. nitrogen.

Nitrogen as NO_3 and NH_3 recovered in Leachings.
Position at end of 15 weeks.

	N_2 as	Limed	Unlimed
Normal Temperature	Nitrates	770 mg.	485 mg.
	Ammonia	17 mg.	70 mg.
		787 mg.	555 mg.
Sub-normal Temperature	Nitrates	87	89
	Ammonia	85	118
		172	207

It is assumed that decomposition in the unlimed pots at normal temperature is proceeding in a normal manner. At normal temperatures, therefore, the effect of lime has been to increase the liberation of N_2 as NO_3 and to depress the amount of N_2 as NH_3. This indicates a very rapid change of nitrogen from the protein form to the nitrate form.

At sub-normal temperatures, it would appear that the activity of the nitrifying bacteria has been reduced practically to a standstill: hence we can look for no effect from liming and no effect is in evidence. The figures for total N_2 recovered, (172 mg.) compared with 787 mg. or 555 mg. with 207 mg., indicate to what extent microbiological activity has been curtailed.

The ammonia nitrogen recovered is higher in the pots at sub-normal temperature, but this does not indicate any greater activity of the ammonifying bacteria, since the low figures for the normal pots are merely an indication of the rapid change to nitrate.

At the end of this period (fifteen weeks) nitrate was commencing to be liberated from the pots kept at reduced temperature, which would show that the inhibiting effect on the microbiological life was beginning to wear off and that the population was becoming acclimatised to the new environmental conditions.

Over the period of the next sixteen weeks, the leachings given off by these pots were as tabulated beneath.

	N_2 as	Limed	Unlimed
Normal Temperature	Nitrates	460 mg.	455 mg.
	Ammonia	Nil	Nil
		460 mg.	455 mg.
Sub-normal Temperature	Nitrates	370	368
	Ammonia	40	45
		410	413

As was anticipated, the amount of N_2 as NO_3 from the pots at reduced temperature gradually increased until the figures were practically the same as those for the normal temperature pots, showing that the microbiological life had become acclimatised to the new conditions.

The effect of the lime dressing would appear to have worn off completely.

It is interesting to note that slight ammoniacal nitrogen losses persist in the soils at lower temperature, but the total loss of nitrogen over the period is approximately the same for all pots.

At the end of this period—thirty-one weeks from the start—a fresh dressing of *Crotalaria usaramoensis* was turned into the pots at the lower temperature, followed six weeks later by a fresh dressing into the pots at normal temperature.

No immediate effect of these dressings became apparent in the case of pots at sub-normal temperatures, as reflected by the figures for nitrogen in the leachings, and at the end of the period under review (forty-three weeks) the amounts of N_2 as NO_3 and NH_3 were similar to those obtained towards the end of the thirtieth week.

In the case of the pots at normal temperature, increased nitrate nitrogen figures were obtained starting about six weeks after turning in of the cover.

Humus Determinations.

Humus determinations carried out at intervals over this period showed small fluctuations in the quantities of alpha humus extracted. Figures for beta humus, however, showed a steady slight upward trend as is indicated by the table on page 16.

Organic Matter Decomposition: Turning in of Fresh Green Covers in the Field.

Plots at the Government Experimental Plantation, Serdang, growing the following covers, were utilised for this experiment:—

(*a*) Mixed legumes—*Pueraria phaseolus* and *Centrosema pubescens.*

(*b*) Upright legume—*Tephrosia toxicana.*

(*c*) Non-legume—*Mikania scandens.*

(*d*) Bare.

Quantities in grams of beta humus extracted from 50 gms. dry soil

	Start 30.3.32	21.4.32	23.5.32	22.8.32	4.10.32
Normal Temperatures					
Limed	5.35	6.25	7.05	7.2	6.9
Unlimed	5.35	6.45	6.3	6.6	7.3
Sub-normal					
Limed	5.22	6.6	6.3	6.72	6.95
Unlimed	5.22	5.8	6.25	6.8	7.1

All plots were divided longitudinally into two, and one half of each was allowed to remain untouched. In the case of (*a*) and (*c*), the cover on the other half was cut and turned in. In the case of (*b*), the cover was not cut but the ground was cultivated, and in the case of (*d*) it was forked.

Circular glazed earthenware pots about 1 ft. deep and of similar diameter were sunk flush with the ground in the centre of each sub-plot and a wire cage containing about 6 in. of the top soil was placed in the top of each pot in order that the leachings might be collected.

Soil thermometers were sunk in both halves of plots (*a*) and the untouched half of plot (*d*).

The following analyses and determinations were carried out at weekly intervals on samples from each of the 8 sub-plots :—

On the soil :

Moisture
Nitrate
Ammonia
Total Carbon and Nitrogen
A and B humus
Carbon and Nitrogen content of each humus and loss on ignition
Residual Carbon and Nitrogen from alkali extract.

On the leachings.

Volume; pH; N_2 as NO_3.

Temperatures were recorded at 6 in. depth daily.

Preliminary analyses of the soil were carried out just previous to turning in of the cover crops. The cover crops themselves were also analysed, and gave the following results :—

PERCENTAGE COMPOSITION OVEN DRY BASIS.

		Mixed Legumes	Non-Legume
Ether soluble	...	3.42	6.6
Water soluble	...	17.50	26.8
Alcohol soluble	...	3.03	3.9
Hemi-celluloses	...	15.40	12.0
Celluloses	...	19.60	12.1
Lignin	...	12.60	11.5
Water insoluble protein	...	13.40	12.25
Total Ash	...	6.70	10.25
		91.65	95.40
Total Carbon	...	47.9	45.3
Total Nitrogen	...	3.22	2.62
Ratio C/N	...	15 :1	18 :1

FRESH MATERIALS.

		Mixed Legumes	Non-Legume
Moisture	...	66.93	85.31
Loss on Ignition	...	30.85	13.18
Ash	...	2.22	1.51
		100.00	100.00
Total Carbon	...	15.81	6.67
Total Nitrogen	...	1.06	0.385

These covers were turned in on 27.11.31 at the estimated rate of 1000 lbs. per acre on Plot (*a*) and 3000 lbs. per acre on Plot (*c*). As each sub-plot was ⅛th. acre, the amounts added were 130 lbs. and 400 lbs. respectively. Analyses were carried out for a period of 7 weeks.

Results.

(1) *Soil Temperatures at 6 ins. below the Surface.* Soil temperatures over a period of twenty-eight days ranged from 80°F to 83°F on the bare plot (*d*). On plot (*a*) on the half into which the cover had been turned, the range was from 79° to 82°F; in practically all cases being 1° lower than the bare plot on any occasion. On the half on which the cover was still growing, the range was from 78° to 80°F—this again on any occasion being 1° lower than the other half of the plot and 2° lower than the bare plot.

A fall of 2 ins. rain in one day, the maximum which fell over the period, produced an effective drop of temperature of 1° only on all of the plots.

(2) *Nitrates and Ammonia in the Soil.* In the case of all eight sub-plots, ammonia in the soil showed very small variation over the period of seven weeks,

remaining throughout in every instance between 8 and 12 parts per million (p.p.m.).

In the case of the untouched halves of every plot, nitrates remained practically constant, varying from 0.0—1 p.p.m., except for the bare plot which, starting with nitrate content of 5 p.p.m., rose to 10 p.p.m. and fell again.

In the case of the treated halves of the plots in plots (*b*), (*c*) and (*d*) there was a steady rise in all cases from 0.0 p.p.m. to about 4 p.p.m. after a period of three weeks which died away to nil again at the end of seven weeks.

Only in the case of the mixed legumes turned in was there any marked rise in nitrate content; on this sub-plot, the nitrate figures rose sharply from nil to 20 p.p.m. after three weeks and continued at this height for the next four weeks.

(3) *A Humus.* This portion of the humus fraction fluctuated slightly in amount over the period, but the general trend appeared to be a loss during the first two or three weeks on the plots into which green cover had been turned, (*a*) and (*c*), and was more particularly noted on plot (*c*)—the non-legume. This initial drop was followed by a rise again until at the end of seven weeks the original level had been regained.

The composition of the product A humus remained constant.

(4) *B Humus.* The figures obtained for the amounts of B humus fluctuated wildly from week to week, but it might be suggested from them that there was a rise in value where cover had been turned in after about the end of the fourth week.

The extent of the fluctuations, however, is too great for any definite conclusion to be drawn from the figures.

(5) *Total Carbon and Nitrogen.* The figures for total carbon and nitrogen fluctuated throughout the period, but there were no definite signs of either a loss or gain in total nitrogen or carbon. This is only to be expected when consideration is paid to the small amounts of green matter added.

It is noteworthy that these figures for the bare plot, both before the experiment began and throughout, are lower for carbon than the figures for those plots which had had cover growing in them for some seasons; the amount is small but definite. Cover crop plots contain about 1.8 to 2.0 per cent. carbon and the bare plot 1.5 to 1.8 per cent. carbon.

This experiment was continued throughout 1932, occasional samples being taken for analysis. At the start of the wet season, the existing covers were turned in and fresh seed planted. Analyses, up to the present date, indicate that there is possibly a very small increase occurring in the amount of A humus extracted from the soils in which covers have been turned in. It is difficult to cite individual figures, as fluctuations within wide limits occur, but the trend may exist.

Total carbon and nitrogen figures, for samples taken throughout the year, show a very considerable drop in the month of April followed by subsequent rises and falls. These fluctuations occur in all the soils. The maximum drop

in nitrogen content is from 160 mg. per 100 gr. to 60 mg. per 100 gm. and indicates large losses of gaseous nitrogen.

This point is subsequently further discussed.

Experiments on the Effect of Turning in of Green Manures on Plant Growth.

A. A series of 12 pots were set up in February, 1932, each containing 6 kgs. of Raub High Level soil. At weekly intervals, 1 per cent. by weight of *Crotalaria usaramoensis* leaves (10 tons/acre) were added to individual pots. One week after the addition to the twelfth pot, maize was planted in all, together with a basic dressing of basic slag (50 lbs./acre P_2O_5).

Owing to inferior seed, germination failed, but the pots were successfully replanted a week later.

The growth of the maize was best in the pots in which the green manure had been turned in, one to four weeks prior to planting.

It would appear that more beneficial effects are derived by planting up within a short time of turning in a cover crop, rather than by allowing the green material to rot down.

B. Further, to test the conclusion reached in the previous experiment, 6 pots of Serdang Black soil were used to compare the effect on growth of rotted grass and fresh grass turned into the soil.

Two pots were treated with a dressing of well-rotted grass, two with fresh grass and two controls.

Maize was planted, and the subsequent growth observed. The difference in growth was very marked and further substantiates the conclusion reached previously that fresh green matter turned into the soil exerts its greatest beneficial effect if planting takes place almost immediately.

C. An experiment was started in October 1932, to compare the fertility of jungle soils and cleared soils, and to determine the influence of jungle mulch.

6 pots were set up containing 24 kgs. each of fresh quartzite jungle soil, and 6 pots containing 24 kgs. of quartzite soil which had been cleared of jungle for some years. To three pots of each series was added about 1½ kgs. of fresh jungle mulch, laid on the top of the soil in imitation of jungle conditions. The remaining 3 pots of each series remained with a cleared surface.

Subsequent growth of maize was best in all the pots with the jungle mulch added, the jungle soil with the jungle mulch being very slightly better than the other soil with jungle mulch.

Maize in the pots without mulch, whether on jungle or cleared soil, made markedly worse growth.

From this experiment it would appear that the fertility of fresh jungle soils is due in some manner to its covering mulch rather than any particular property of the soil *per se.* This effect of mulch may be due to its protective

action on the soil, or to nutrient material liberated on breakdown or, in practice, on burning.

D. In order to test out this conclusion, a further experiment was devised in which the effect of this jungle mulch could be determined. In combination with this, information was sought on the effect of 'burn' on soil.

A series of 30 pots, the treatments in triplicate, was set up with quartzite soil.

The treatments were as follows:—

1.	Top 3 ins. of soil	heated to	75°C.
2.	do.	do.	100°C.
3.	do.	do.	150°C.
4.	do.	do.	200°C.
5.	do.	do.	250°C.
6.	do.	do.	300°C.
7.	do.	do.	350°C.
8.	do.	do.	400°C.

9. Soil covered with 2 ins. of artificial mulch of torn paper.
10. Soil covered with burnt forest mulch.

It was hoped that this would indicate whether the beneficial effect of jungle mulch was due to its protective action or its chemical composition, and further, in the case of a burn, whether or not the action was one of partial sterilisation of the soil.

The pots were planted with maize and at the end of six weeks the position was as follows. The maize in treatment 10 had made best growth—closely followed by treatment 9. Treatments 5—8 were very much inferior whilst treatments 1—4 were slightly better than this, but not as good as treatments 9 or 10. Growth in all cases, however, was bad and the plants were weedy and straggly, although originally they showed much greater promise.

This experiment indicates that the effect of jungle mulch is probably both protective and chemical and that the main effect of a burn is one of liberation of chemical products for plant nutrition rather than partial sterilisation. Growth was, however, so poor that further work is required before definite conclusions can be drawn.

General Considerations.

The Nitrogen Problem.

Total Nitrogen Content of Soils.

In the latest of a series of papers on nitrogen recuperation in the soils of the Bombay Presidency, Sahasrabuddhe and Kanitkar* have summarised their views to date on the results of their experiments and state that definite recuperation of nitrogen takes place in these soils under field conditions; that

* *Indian Journal of Agricultural Science,* Volume II, Part V, October, 1932.

the addition of organic matter in the form of farmyard manure or green manure increases the recuperative power of the soil, and that, over a period of one year, from month to month the nitrogen content of the soil is not a stable or a constant quantity. With regard to these conclusions, it should be pointed out that the soils they are dealing with have an average nitrogen content of about 100 mg./100 gm. soil or 0.010 per cent. N_2—and that their findings are based on analytical data which are obtained from 20 grams of air dry soil by means of Kejldahl determinations.

Experiments in this laboratory on 5 gms. samples of air dry soil indicate that a single Kejldahl determination of the N_2 content of an air dry soil is liable to a 10 per cent. sampling error. A mean of duplicates, therefore, will have an error of about 7 per cent. Some of the conclusions reached in their earlier paper are based upon differences in nitrogen content which lie within this error.

The results of their month to month determination of total nitrogen, however, show much greater nitrogen variation than could possibly be accounted for by experimental or sampling error, the range of fluctuation being from 70 to 130 mg. of N_2 per 100 gm. soil.

The conclusion that the total nitrogen content of soils is not a stable or a constant quantity is borne out by the results of these pot experiments on the loss of nitrogen by leaching and also by the figures obtained in the field from Block XIV at Serdang. Here spasmodic sampling showed a drop of from 170 to 60 mg. per 100 gm. soil in these plots during the period January to April 1932—with a subsequent rise and final figure at the end of the year of about 100 mg. per 100 gms. soil.

Ignoring the possibility of sampling error, results have been obtained which would also support the further conclusion, that the addition of a green manure has aided the recuperative power of the soil.

However, these results, in combination with accidental observations obtained from experiments designed for other purposes, all tend to show that the total nitrogen content of Malayan soil is subject to great fluctuation.

Many Malayan soils contain nearly as much nitrogen and carbon in the sub-soil as in the top soil.

The evidence from pot experiments has shown that, undoubtedly, soluble nitrogen and carbon is being washed through. Vageler has suggested that, in non-calcareous tropical soils, nitrogen may be lost as soluble humate. It is a reasonable hypothesis, therefore, that the high nitrogen and carbon content of some sub-soils may be due to the gradual storage by long accumulation from these soluble humates being washed downwards.

But, as has been pointed out previously, the fluctuations which have been found to occur in total nitrogen content are far too great to be accounted for by loss as soluble humate.

One is forced to the conclusion that these enormous losses are mainly in the form of gaseous nitrogen. To counteract these losses, however, large

recoveries are taking place, producing the fluctuations observed. This can only mean that rapid fixation is occurring at certain seasons.

Mr. R. A. Altson, Assistant Mycologist of this Department, has isolated Azotobacter from typical Malayan soils, and has shown that such isolations are capable of fixing nitrogen in culture; and though it has not yet been demonstrated that this function is performed in the soil, it is possible that any fixation which may have taken place in the experiments so far conducted has been masked by rapid denitrification. Clostridium was found to be present in most of the soils which he examined.

Nitrogen as Nitrate and Ammonia.

An examination of the literature on laboratory experiments bearing on the problem of nitrification in soils has shown that, in the majority of instances, the dressings of nitrogenous fertilisers added have been excessively heavy, and in few cases only has the rate of application being comparable with field dressings—*i.e.* a rate of 1—2 cwt. per acre of fertiliser equivalent to say 40 lbs. nitrogen per acre.

Excessively heavy dressings are liable to upset the normal sequence of changes which would occur in the field and as a consequence, therefore, experiments as carried out in this laboratory have all been with normal rates of application of manures.

Unfortunately, this means that natural fluctuation and experimental errors are comparable with the effects to be looked for from any nitrogenous dressing—and some experiments have, in consequence, given negative results.

One or two definite indications, however, have emerged. It would appear that maximum nitrate nitrogen accumulation occurs at a period of four to six weeks after application of a dressing; further, if any excess of nitrogen occurs in the soil as ammonia, this is very liable to be lost in drainage instead of being held by the colloidal complexes in the soil as has been shown to occur in other countries.

The Organic Matter Problem.

In view of the remarks so frequently read and heard in Malaya, that the turning in of a green manure into the soil increases the 'humus' of the soil, (with no definite indications of what is meant by humus), experiments have been carried out to determine, as far as possible, what is the fate of covers turned into soils, and what their effect is on the soils.

Conditions in Malaya are practically ideal for the complete and rapid oxidation of organic matter to carbon dioxide, ammonia and water by micro-organisms, there being a high temperature and plenty of moisture, although admittedly calcium carbonate is lacking.

In addition to this process of complete oxidation to carbon dioxide, ammonia and water, there exists in nature the process of humification whereby some part

of the added organic matter is not completely destroyed, but survives in an altered form as a dark-coloured amorphous material which is known as humus.

Humification may occur in three ways—

(1) Anaerobic humification

(2) Acid humification

(3) Humification under semi-arid condition.

Anaerobic humification occurs in ponds and lakes under water-logged conditions and it is this type of humification which probably accounts for the belts of coastal peat formed in Malaya.

Acid humification occurs where organic matter is decomposing in the absence of calcium and other bases, as is exemplified by the production of acid peat under heath or conifer forest conditions. In this case, the peaty organic matter accumulates as a sharply defined layer at the surface. The peat found in patches on the hills of Malaya may have been formed in this manner.

Humification under semi-arid conditions, as is exemplified by the black earth soils of Russia, occurs where there is a deficient rainfall but a high content of calcium and other bases which prevents the formation of an acid peat.

On the plains of Malaya, on free draining soils—which are in the majority—none of these three conditions are satisfied. The position we reach, therefore, is that no conditions exist which are known to be suitable to the formation of humus and that conditions are practically ideal for the rapid and complete destruction of organic matter to carbon dioxide and water. The natural inference therefore is that no humus will be formed in these soils.

In practice, it is found that a normal inland soil of Malaya of the quartzite or granite type has a total organic matter content of about 6 per cent. as compared with figures for English soils of from 10 per cent. to 20 per cent. This being the total organic matter content, the possible amount of humus present is very small indeed.

The results of experiments described this year have shown that where covers have been turned into the soil, the amount of humus (alpha and beta) subsequently extracted shows no real increase.

It is clear that there is no lack of microbiological life in Malayan soils since, even in the absence of added organic material, nitrification proceeds normally, and as has been mentioned, at times rapid fixation must occur.

Green matter added to Malayan soils clearly, therefore, does not fulfil its usual role in the formation of humus. It is possible, however, that humus may be formed, and, according to Vageler's theories, be immediately lost in soluble form in the drainage waters; but there appears a more likely explanation.

If we examine the results obtained in this experimental work, it will be noted that the turning in of green manures has been accompanied in all cases by a great stimulation of growth. Observations have shown that immediately after turning in, rapid production of ammoniacal and nitrate nitrogen occurs, extending over a period of six to eight weeks, and that this production is

absorbed by growing plants. It seems abundantly clear, therefore, that intensive and rapid destruction of the organic material is taking place with the liberation of carbon dioxide, water and ammonia and that this destruction extends to practically the whole of the plant tissues, the amount of humus formed being negligible.

Herein, too, possibly lies the explanation of the fact that plants thrive best if green matter is turned in only shortly before planting. The view is usually held that the turning in of a green manure immediately prior to planting is disadvantageous because the rapid decomposition of the excess of carbohydrates which takes place uses all the reserves of nitrogen from the soil so that none is available for the plant. So far from this being the case, the experiments carried out under fallow conditions show that there is actually an excess of ammoniacal nitrogen liberated in the soil. Under non-fallow conditions, this ammoniacal nitrogen is rapidly changed to nitrate nitrogen and hence is of immediate benefit to the plant. The plant receives the benefit of a good nitrate supply at an early stage of growth : this lasts as long as there is readily decomposable protein matter still extant in the cover turned in.

Further, it must not be forgotten that this rapid destruction is accompanied by a large evolution of carbon dioxide and there is evidence from numerous workers of this constituting a form of fertilization.

There remains, however, a point raised in Part II of this series. Why should the benefits conferred outlast the period of rapid decomposition if these benefits are attributable only to the nitrate supply and possibly the fertilization value of carbon dioxide? Two suggestions are there mentioned, either that the formation of iron humate renders iron available, or that an increase of available nutrients is obtained by the acceleration of mineral decomposition.

These questions and suggestions in themselves indicate the lines along which future work will be directed.

MUSHROOM GROWING IN PROVINCE WELLESLEY & PENANG

BY

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The cultivation of mushrooms is a recent innovation in the Malay Peninsula though it is said to be practised fairly extensively in Netherlands India. The initiative in Malaya was taken by a few Chinese in Penang who introduced spawn from China in April 1932 and have since carried on a small, though profitable industry, at Sungei Nibong and at Genting. A trial mushroom bed was started at Bukit Merah Padi Test Station in May 1933, and the results so far obtained have been encouraging.

The fungus in question was identified by the Mycologist as *Volvaria volvaceae*, which is the principal species cultivated in Netherlands India. It is a large pileate fungus with a dark grey-coloured cap, some three inches in diameter when fully expanded. It appears as a small "button" completely surrounded by a rather thick volva which persists until the fungus is about one-third its full size. It has no annulus. Figure 1.

For purposes of cultvation, the only essential factors are an abundance of padi straw and an adequate supply of water. The straw needs to be spread out and carefully picked over, all the leaves being removed, so that only the haulms remain. These are then made into small bundles or sheaves and are soaked in water for two days. While they are soaking they should be trodden from time to time to render them soft and pliable. A low earth bed (say 16 feet x 3½ feet) is then constructed to a height of twelve inches and a layer of spawn is distributed evenly around the edges. Over the spawn, sheaves of straw are laid crossways to form a continuous layer. The length of the straw is usually such that one end must be bent back so that the haulms fit the breadth of the bed. When the next layer is applied the opposite ends are bent in the same way so that the surface remains approximately level.

The third layer of sheaves is laid lengthwise, instead of crosswise, and water is poured over the surface. The mass is then pressed down, to consolidate it as far as possible, and another layer of spawn applied. This process is repeated. After the third application of spawn, the same arrangement is followed, with the addition of a kind of thatch, in which the sheaves are made to slope upwards towards the middle, and the bed is completed by spreading a thin layer of haulms right over it from side to side.

Copious supplies of water must be given with the construction of each successive layer. Such a bed would be about four feet high (though it subsides somewhat with age) and would present in section, the appearance shown in Fig. 2.

It is convenient to surround the bed by a shallow ditch from which water can be readily obtained later. For a bed of 16 ft. x 3½ ft. x 4 ft. one bag of spawn containing twenty-five gantangs (Imperial gallons) is regarded as sufficient.

According to Chinese growers, no further watering should be done for a week after the spawn has been sown, though the validity of this statement remains to be tested. At the end of this period, however, water must be poured over the bed twice daily, morning and afternoon.

At Bukit Merah, the first mushrooms were harvested 25 days after the spawn had been sown. Their appearance followed two days of heavy rainfall.

Under favourable conditions 1—2 kati* of fresh mushrooms per day may be obtained from a bed of the dimensions given above, though periods of dry weather reduce the yield or, if prolonged, may suspend it altogether until there is further rainfall. In this connexion, it may be noted that watering, as ordinarily practised, does not appear to offer an effective substitute for rainfall though it would presumably do so if the water were applied in sufficient quantity or over a sufficient period of time. After a few weeks, the internal temperature of the bed is about 45°C at six inches from the surface and 50°C at a depth of one foot. Later the temperature gradually decreases.

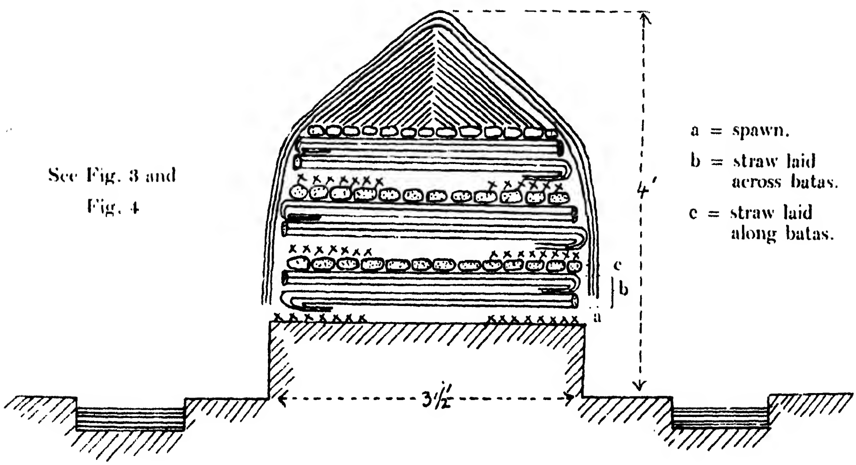
The mushrooms are preferably picked in the "button" state (*i.e.*, before the volva has broken) and eaten fresh. If, however, it is desired to keep them they may be dried over a charcoal fire. For this purpose, the apparatus shown in Figure 5 is used. It consists simply of a broad basketwork cylinder made from bamboo, within which a removable platform of the same material is supported by two horizontal wires fixed at right angles across the cylinder. The charcoal fire is made in an iron pan and placed under the platform. The drying process takes about twelve hours.

When fully dried, the mushrooms may be kept almost indefinitely provided that they are stored in air-tight tins, such as that shown in Figure 6. If the tin is not air-tight, the mushrooms tend to acquire a rather unpleasant smell which, however, disappears to a large extent on cooking. Eight to nine kati of fresh mushrooms will give one kati of the dried product.

The time which should elapse before a bed should be broken up is, to a certain extent, a matter of discretion. The important point is that the whole mass of straw should be permeated by the mycelium so that it can be used as spawn for the establishment of new beds. Three months from the date of sowing is regarded as a suitable age for this. A bed of 16 ft. x 3½ ft. x 4 ft. may be expected to yield about ten bags of spawn which are sufficient for the establishment of ten new beds. If sufficient straw is not available for the construction of new beds, the spawn should be dried in the sun and stored in sacks for the next season. It is stated, however, that the viability of the spawn

*1 kati = 1⅓ lbs.

Fig. 1. Volvaria volvaceae -Fully expanded.



See Fig. 3 and Fig. 4

Fig. 3. Mushroom Bed—Earth Bed before straw has been laid.

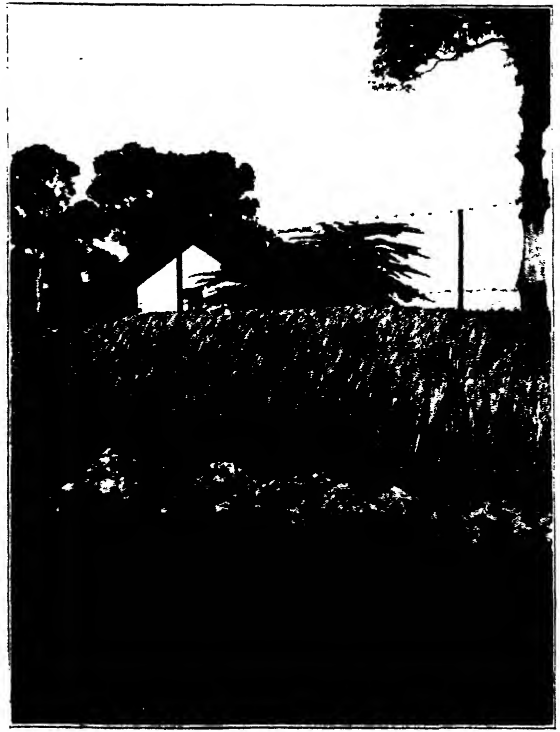


Fig. 4. Finished bed.

diminishes if it kept too long and that it is preferable to establish a series of new beds whenever the old ones are broken up. At the same time, old rotted straw is not regarded as suitable so that, if the mycelium is to be retained active throughout the year, provision must be made for the proper storage of large supplies of straw.

The usual market prices for mushrooms in Penang are as follows :—

Dried	...	\$1.20 — \$1.50 per kati.
Fresh	...	0.30 — 0.35 ,,

As eight to nine kati of fresh mushrooms yield only one kati of dried mushrooms, it is usually more profitable to sell them in the fresh state, and only those which are unsellable are dried.

In districts where padi straw is readily available, mushroom cultivation would seem to have several points in its favour, namely :—

(*a*) no materials are necessary except straw and water.
(*b*) the only capital expenditure required is the initial purchase of spawn,
(*c*) although the beds require constant attention, the work is in no way laborious and would not occupy more than an hour or two every day,
(*d*) in so far as there is apparently a wide market for mushrooms, the occupation would probably be very profitable.

With regard to (*b*) it may be remarked that there is no reason why spawn should not be made available at very much lower prices than at present. At the time of writing, the industry is exclusively in the hands of a few growers in Penang who require \$4 for a bag of spawn. This price could almost certainly be very greatly reduced.

As regards (*d*) it may be noted that the demand in Penang greatly exceeds the supply and that, in order to purchase fresh mushrooms, it is necessary to to visit the market early in the morning. Later in the day the stock is sold out. The consumption, it is true, is chiefly by Chinese, but enquiry shows that Malays are also fond of mushrooms though they ordinarily eat wild species only. Flavour is not likely to present a difficulty and *Volvaria*, in fact, resembles the English mushroom very closely in flavour.

There remains also the possibility of exporting dried mushrooms from padi areas (where alone their cultivation could be profitably undertaken) to areas in which padi is not grown. It is probable, therefore, that mushroom growing would form a profitable accessory industry to padi cultivation, in much the same way as does fish-rearing at present.

Summary.

1. The cultivation of the edible mushroom—*Volvaria volvaceae*—on padi straw is described.

2. Yields of one to two kati of fresh mushrooms per day may be obtained during the season, from a bed 16 ft. long, 3½ ft. wide and 4 ft. high.

When such a bed is broken up, spawn, sufficient for the establishment of 10 new beds, can be obtained.

3. A description of a method of drying fresh mushrooms over a charcoal fire is given. It is found that eight or nine kati of fresh mushrooms will be required to produce one kati of dried mushrooms.

4. The usual market prices for mushrooms in Penang are $1.20 to $1.50 per kati for dried and 30 cents to 35 cents per kati for fresh mushrooms.

At present the demand in Penang exceeds the supply.

5. It is considered that mushroom growing could form a profitable accessory industry to padi cultivation, since the only materials required are padi straw, water and spawn; the work is not laborious and there is a ready market for the produce.

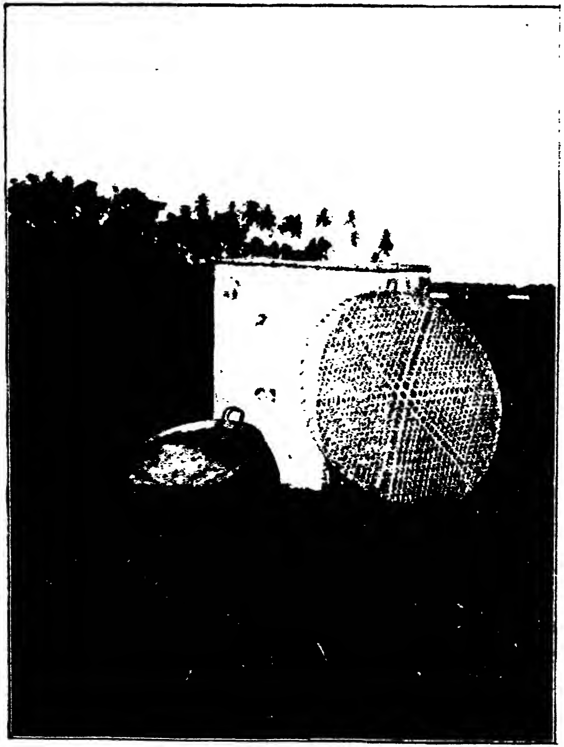


Fig. 5. Apparatus used for drying Mushrooms.

Fig. 6. Air-tight tin suitable for storing Mushrooms.

THE OIL PALM IN SUMATRA

BY

J. N. Milsum,

Senior Assistant Agriculturist.

Introductory.

In the following article it is proposed to record observations made during a visit to the East Coast of Sumatra in May, 1933. A number of estates were visited with the object of ascertaining recent advances in oil palm production in that country. Since the cultivation of this crop is now on an established basis in Malaya, the more important points of interest only are recorded.

Area under Cultivation and Production.

The planted area of oil palms in Sumatra at the end of 1932 is shown as 155,000 acres, of which 97,120 acres were in bearing. The acreage under oil palms in Malaya at the end of 1932 was 61,025 acres.

Exports of oil palm products during the years 1931 and 1932 for Sumatra and Malaya respectively are as shown in the following tables:—

Exports of Oil Palm Products from Sumatra.

Year	Palm Oil.		Palm Kernels.		Total Value of net exports. F.
	Quantity Tons.	Value F.	Quantity Tons	Value F.	
1931	60,420	12,084,241	11,996	1,092,149	13,176,390
1932	83,633	11,843,769	17,586	1,190,065	13,033,834

Average exchange value during 1931 $100 = F. 139.
1932 $100 = F. 98.

Exports of Oil Palm Products from Malaya.

Year	Palm Oil.		Palm Kernels.		Total value of net exports $
	Quantity Tons.	Value $	Quantity Tons.	Value $	
1931	4,575	1,011,610	727	112,093	1,123,703
1932	7,892	1,136,841	1,248	162,695	1,299,536

Returns from the East Coast of Sumatra and Acheen for the year 1932 were 98,036,317 kilos palm oil and kernels from a productive area of 39,321 hectares. This represents a return of oil and kernels amounting to 2,493 kilos per hectare. On a basis of 20 per cent. kernels to oil in production, it will be seen that approximately 2,000 kilos oil and 500 kilos kernels were obtained. This represents yields of 1,784 lbs. oil and 446 lbs. kernels per acre from the area in production. These figures agree closely with the estimated figures of crop returns for an estate in full bearing, published in Bulletin No. 39, Department of Agriculture, S.S. and F.M.S. (1927), page 79; *viz.* 16 cwts. (1,792 lbs.) palm oil and 4 cwts. (448 lbs.) kernels per acre.

Seed Germination and Nurseries.

In general estate practice, seeds are sown in sand beds in damp situations. Higher germination is obtained in beds exposed to full sunlight than those in the shade. Germination is less rapid during the rainy season than during dry weather, owing to the sand beds remaining in a damp condition and developing less heat from lack of sunlight. The usual germination obtained is 80 per cent. within five to six months from sowing. Experiments have shown that immersing seeds for two days in a 1 per cent. solution of hydrochloric acid and rinsing for two days in running water, results in a considerably increased rate of germination.

Seedlings are transplanted from the seed beds when they show two leaves. The land selected for this purpose is always, as far as possible, in a sheltered position with moist fertile soil.

It may be mentioned here that very considerable importance is attached in Sumatra to planting new areas with palms raised from seed of known parentage. The General Experiment Station of the A.V.R.O.S., in conjunction with a number of estates, have paid particular attention to this subject. An adequate supply of such planting material is available, and results to-date thoroughly justify the care taken in this connexion.

Planting.

Palms are generally planted in the field when one year old. The usual planting distance is 9 metres by 9 metres (29.5 ft. by 29.5 ft.) triangular and, although slightly closer planting was seen, the wider spacing is generally undertaken. On hilly land, a planting distance of 9 by 6 metres (29.5 ft. by 19.7 ft.) is sometimes employed. On such land, planting on contour is considered advisable for the purpose of facilitating harvesting operations.

Upkeep of Plantation.

The use of cover crops throughout all planted areas is general and, by a system of selective weeding, it is possible to keep weeding costs at a very low figure. In new clearings four rows of lamtoro, *Leucaena glauca,* are sown

between the rows of young palms. The lamtoro is cut back to 2 feet from ground level when 9 to 12 months old and subsequently slashed every six months. A mixture of *Centrosema pubescens* and *Pueraria javanica* seeds are sown between the rows of lamtoro and allowed to climb over the latter. In course of time the two low-growing cover plants smother out the lamtoro, which dies down and forms a layer of surface humus. This combination of erect and creeping leguminous plants in new clearings appears most effective and several large areas so treated were seen.

In low-lying fields, peria (*Momordica charantia*) is frequently used as a cover plant and makes very even growth in such situations. This cover crop is gaining in popularity since it is of rapid growth and when once established prevents growth of all weeds.

In all clearings, a space of 5 feet radius is kept clean-weeded round the base of the palms. As the palms mature, these spaces are connected up and strip weeding is undertaken, with the object of allowing freedom of movement in harvesting.

On the edges of fields, or in other situations where the growth of cover plants is slow, the legumes are encouraged to ramble by the provision of twigs and palm leaves. The excellent growth of the several cover crops seen, is due undoubtedly, to the regular use of fertilizers. Hand-weeding is generally practised with the object of not stirring the soil, since this encourages surface erosion.

Pruning.

Little or no pruning is carried out on young palms until harvesting commences, usually at about four years from planting. The palms are then cleared up to permit easy collection of the fruit bunches. The removal of the lower leaves is considered to assist natural pollination. Pruning is undertaken subsequently once a year when all palm trunks are cleaned of ferns and other saprophytic growth. Between the intervals of annual pruning, only those palm fronds that are dead, or impede the harvesting of bunches, are removed by means of a short-handled axe. A larger portion of petiole is allowed to remain than is usually seen in Malaya.

Artificial Pollination.

Artificial pollination is commonly practised but is not general. So far as could be ascertained, the consensus of opinion favours artificial pollination in conjunction with regular manuring with artificial fertilizers. The collection of pollen is carefully supervised, since the fresh conditions of pollen, when applied to the female inflorescence, is of paramount importance in securing satisfactory results. Palms are patrolled every four days, requiring approximately one pollinating labourer for every 170 acres of palms in bearing. To enable the pollen to obtain access to the maximum number of female flowers, the labourers

engaged on the work of artificial pollination are provided with an iron L-shaped hook to open the fibrous sheath enveloping the flowers.

Manuring.

The use of fertilizers is generally undertaken, often before the palms reach the bearing stage. The most usual form of manuring is by the use of Cheribon rock phosphate applied annually at the rate of 2 kilos (4.4 lbs.) per palm. This is equivalent to an application of 242 lbs. of Rock phosphate per acre per annum. The cost of manures amounts to approximately Guilders 3.50 per acre with an additional 45 Guilder cents for application. The Rock phosphate is often broadcast on the surface of the cover crops and is washed into the soil by rain. It is obvious that this method of applying Rock phosphate, if as satisfactory as stated, is very economical.

A large number of manurial experiments are carried out on oil palm estates in collaboration with the staff of the General Experimental Station of the A.V.R.O.S., Medan. The size of the individual plots is usually 30 or 36 palms in 6 or 8 replications.

The form of manurial experiment commonly employed is as follows:—

Phosphoric acid,	Rock phosphate or Gafsa, 2 kg. (4.4 lbs.) per palm every year or two years.
Phosphoric acid and Potash.	Rock phosphate and sulphate of potash, 1 kg. (2.2 lbs.) of each fertilizer per palm every year or two years.
Complete Fertilizer.	Rock phosphate 2 parts, ammonium sulphate 2 parts and sulphate of potash 1 part, 2 kg. (4.4 lbs.) of the mixture per palm every year or two years.
Control.	No manure.

In general, the use of rock phosphate has given the most economical increases. A number of experiments have shown an immediate increase of crop of 60 per cent. as a result of the application of phosphate in this form. In new areas, small manurial trials with maize, *Zea Mays*, are laid down to serve as an indication of any marked deficiency of phosphoric acid. Both oil palms and maize react to phosphate under average conditions in Sumatra. Maize, however, reacts to all three fertilizers; whilst oil palms show relatively little response to nitrogen and potash.

It is thus possible by a series of small plots to obtain a preliminary idea of whether response may be expected with the particular soil, from an application of phosphatic fertilizer. The difference in behaviour of the maize plots may be judged by appearance, and when the plants have reached optimum growth, by the weight of green matter and grain. A number of such trials were examined indicating, in the majority of instances, a deficiency in the soil of phosphoric acid.

In addition to the use of artificial fertilizers, all trash and fruit residues from the factory are removed by the estate light railways and returned to the field.

Harvesting and Transport.

Since harvesting is a very important field operation, a considerable amount of organisation is given to this matter. On the estates visited, all fields are connected with the factory by a system of light railways. Each labourer is allotted a definite area, usually about 15 hectares (37 acres). The harvesting tasks are changed periodically to apportion the work fairly. The strongest labourers are employed in harvesting and become very adept in removing the bunches from the palms, without, under normal circumstances, the assistance of ladders. The fruit bunches are cut with a short axe and the crop is carried to the railway in two baskets supported by a "kandar" stick. The harvesting operators are paid by results, in addition to a minimum wage. With palms of moderate height, a good labourer will collect an average of 1,000 kilos (2,205 lbs.) fruit bunches per day. In the case of ten year old palms, averaging 14 to 15 metres (46 to 49 feet) in height, the average daily crop harvested by each labourer is 800 kilos (1,760 lbs.) fruit bunches delivered to the estate railway.

Yields.

It is, of course, impossible to make any general statement regarding yields. On those estates visited, crop returns appeared very satisfactory. It was stated that, to maintain high yields, regular manuring was necessary. On one estate the average production of palm oil in 1932, from an area of 1,700 acres of ten year old palms, was 22½ cwts. per acre. Higher yields are obtained from areas planted from seeds of high-yielding palms. In one instance, a yield of 4,055 lbs. of oil per acre was recorded from a field of 88 acres of seven year old palms.

Factories.

As is generally known, the system of oil extraction in vogue in Sumatra is the press system. Two types of installation were seen, namely the Stork and Krupp, of Dutch and German manufacture, respectively. These installations have already been described in this Journal, vide Vol. XIX, page 533, and Vol. XXI, page 272.

With regard to the recovery of oil and kernels, factory records examined range as follows :—

Oil obtained from bunches—15 to 18 per cent.

Kernels obtained from bunches—3 to 3.8 per cent.

Acknowledgments.

The writer is indebted to Dr. A. d'Angremond, Director of the General Experiment Station of the A.V.R.O.S. and his scientific staff for the courtesy and assistance given. Also to the managers of the various estates visited.

Abstracts.

THE STEADY ADVANCE IN TEA PRICES.

Mr. L. G. Stephens, writing in "The Financial Times," states that while most tea shares at present prices are already discounting the immediate position, the prospects of better results in the future give scope for further recovery. His article, which strikes an optimistic note, is as follows :—

On several occasions during recent months when reviewing the tea position it has been pointed out that the selling price of tea had fallen to a greater extent than was actually justified by the statistical position of the commodity But as has been the case with so many products during recent years, a surplus of even a moderate amount, combined with the possibility of further accumulations, has been sufficient to have a marked effect on prices at the sales.

Some reflex of this contention in regard to tea has been seen in the advance which has taken place in selling prices for all teas at the auctions since the announcement of the unanimous adoption of the restriction scheme by the producers in India, Ceylon and the Dutch East Indies.

The following table shows the averages at last week's sales, together with a comparison of the same date in 1932 and in 1931 :—

		3rd Aug., 1933.	11th Aug., 1932.	13th Aug., 1931.
Northern India	...	11.11d.	7.71d.	9.46d.
Southern India	...	10.92d.	6.61d.	7.45d.
Ceylon	...	1s. 1.78d.	8.07d.	1s.0.50d.
Java	...	9.18d.	4.71d.	6.39d.

It will be seen that the averages are not only well above those of 1932, but also they are ahead of those for the corresponding sale in 1931.

Common Varieties.

So far the teas which have benefited most are the common variety, the latest average for these being 9¾d. per pound, which compares with the lowest point touched of 4½d. per pound.

Medium teas are now coming into keen demand, and at the past week's sale some of these teas are up by 1½d. per pound.

It should be pointed out that the advance of recent weeks has been in spite of the fact that the sales have mostly comprised the finish of last season's teas from Northern India.

The first of the new season's teas from Northern India will shortly be coming up for sale, and also the better quality teas from Ceylon. The auctions will, therefore, be watched with considerable interest. Further good sales are anticipated, the demand being stimulated by the knowledge that there will be a decrease in supplies as the effect of the restriction scheme comes fully into force.

The competition at the auctions has been very keen, and the trade is apparently of the opinion that higher prices will be reached and maintained.

It may be recalled that the restriction scheme is to date as from April 1 last, and is to be in force for a period of five years, the estimated decline for the first year being approximately 121 million lb.

One of the strong points of the scheme is the prohibition of fresh planting during he period of restriction.

The scheme was the subject of lengthy discussions and has been so designed as to be as effective as possible, and the export of tea is now subject to licence by the various Governments.

Producers' Burdens.

It would, indeed, seem that "the old order changeth, giving place to new." Whatever the economists of the past may claim for the laws of supply and demand, producers have had to invent new rules which act more quickly, rather than just wait for the survival of the fittest with a drain on all concerned.

With the chief buying of commodities now in the hands of a few strong groups, with the lesser concerns following their lead, the lot of the producers has indeed been a parlous one. In the case of tea they have had to carry the burden of harvesting and financing crops without the certainty of even getting back their outlay. Thus, with a product such as tea, where the centres of production are within a certain geographical area, a combination of producers is the only logical outcome, and this is possibly of benefit to the consumers also, because, had large areas been forced out of production, there would have been a great shortage of tea later on with a corresponding rise in the price.

The restriction scheme aims at so regulating supplies as to give to growers an adequate return for the risk involved in producing a semi-tropical commodity, without unduly raising the price to consumers.

Propaganda Work.

The various tea associations are also fully aware of the importance of extending the market for tea. In the past India has been the only country to levy a cess for this purpose, the funds so raised being used to carry on propaganda. The chief centres of activity have been in India itself, where, in spite of the fact that this country produces the bulk of the tea, little is retained for internal consumption. Good work has also been done in the United States. Naturally, these efforts have been retarded owing to the depression, but the work has been continued.

It is now hoped to bring all the various producers into a scheme so as to carry on the propaganda as a whole. With Ceylon and the Dutch East Indies providing funds for this purpose, work on a much larger scale can be undertaken.

The Indian Tea Association has also been selling a fair quantity of tea to Russia, as it is realised that it is important, as far as possible, to keep the taste

for tea alive in that country. The contracts that have been made have been on long-term credit, all of which have been duly carried out. But, owing to the recent breaking off of trade relation with that country, the contracts had to be suspended. It is hoped to get these fixed up again.

One of the features in regard to tea is that the consumption in the United Kingdom has continued to expand in spite of the depression through which the country has been passing.

British Market.

The following figures of consumption per capita in the United Kingdom during the last ten years are significant:—

	lbs.		lbs.
1923	8.60	1928	9.15
1924	8.82	1929	9.25
1925	8.85	1930	9.80
1926	8.91	1931	10.30
1927	9.02	1932*	11.00

*Estimated.

As to individual companies, with the reduction in crops, costs will show some advance, but these will on the whole be well below the level of recent years. The stopping of manuring and other economies will tend to keep down costs. Even with restricted crops the earning capacity of most companies will be good, owing to the low figure at which the estates are capitalised. The fluctuations in earnings as represented by 1d. per pound on the last crops, are set forth in the manual published by the "Financial Times."

Inasmuch as the companies have suffered by falling prices, owing to the percentage which a few pence per pound represents, so in the recovery they will benefit.

The share market has been very active, with an all-round advance in prices, the keen demand for stock having found the market in short supply, and buyers have had to advance prices in order to secure the shares required.

While most shares at present prices are already discounting the immediate position, the prospects of better results in the future give scope for further recovery—*The Planters Chronicle.*

GERMINATING COCONUTS ON A NEW VOLCANIC ISLAND, KRAKATOA.†

After being quiescent for more than forty-three years, the Krakatoa volcano renewed its activity in December 1927. Heavy eruptions started from a submarine crater situated in the centre of the basin, between the three islands of the Krakatoa group, and the ejected volcanic materials formed a cone which in January 1928 appeared above the surface of the sea, and formed an island which was 175 metres long and 3 metres high. In the following months activity

† The following interesting account was published as a letter under the signature of W. Docters Van Leeuwen, Leersum, Bergweg, 188 in *Nature* October 18, 1933.

was most severe and a cone 200 metres high was built up having a volume of about twenty-five million cubic metres! This island was soon destroyed by the waves and eventually disappeared. This was Anak* Krakatoa I.

Activity started again on March 25, 1928, but it was not until January 1929 that a second new island rose above the waves. At the end of February the island was about 40 metres high and 275 metres long. In the early days of July this island, Anak Krakatoa II, also was washed away.

Anak Krakatoa III was born on June 3, 1930, and it was destroyed by the sea on August 8. The submarine cone, however, was now so firmly constructed that three days later the fourth child of Krakatoa appeared, which was a healthy baby, and grew in a short time into a big island, Anak Krakatoa IV.

In the month of January 1932, one of the officials of the volcanological service, who paid a visit to the new island, brought me some seedlings, picked up by him on the beach, and I had myself an opportunity of visiting the island in the month of May of the same year. It was then 40 metres high and comprised an eccentric hot crater lake and some solfataras on its margin. The wall of this lake was on one side 40 metres high and very steep, and sloped on the other side gently to the beach, which was more than 1 km. long.

On this beach, which consisted of black sand, a great quantity of pumice and logs was washed ashore and many plant seeds had already germinated. I found many seedlings of common drift plants and of plants of the *Barringtonia* association. The following seedlings were found: *Pandanus tectorum, Canavalia rosea, Ipomoea pes-capræ, Barringtonia speciosa, Terminalia Catappa, Xylocarpus granatum, Pangomia pinnata,* and 41 germinating coconuts.

This last find was of special interest, as in this case there could be no question at all whether the nuts had been planted or not. No native, with the exception of the coolies of the volcanological service, had dared to land on this still active and treacherous crater, nor was there anything for them to find there. Moreover, the coconuts lay on the beach and were mostly unburied, lying between the pumice and the logs in the same disorderly manner as the seedlings of the other plants, as to which no one questions their distribution by the sea. Some coconuts were just beginning to sprout; others had already formed a bunch of leaves and were rooted firmly in the soil. They were here in exceptionally good condition, as the crabs, which often ruin the germinating nuts, were not present on the beach. We thus find on this new island a strong proof of the ability of the coconut, when washed ashore, to establish itself on the beach without human aid.

After a rest of some months, the crater again started into activity in November and the poorly-developed vegetation was covered over by the ejected volcanic material.

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* **Anak is the Malay word for child.**

Reviews.

Latex and its Industrial Applications, by Frederick Marchionna.

This book, published in 1933 by the Rubber Age Publishing Co. New York, consists of 1037 pages which includes separate indexes of authors, patentees, patents and subjects. It contains a preface by Professor G. Bruni of the Pirelli Rubber Co. Milan and a preface by the author, together with a brief Historical Introduction.

The first seven chapters of the book, dealing respectively with rubber plants; the planting and cultivation of rubber; collection and extraction of latex; preservation of latex and rubber; behaviour and characteristics of latex; coagulation of latex and preparation of raw rubber; consist mainly of brief introductions followed by useful abstracts of patent and technical literature relating to the problems in each individual chapter.

Chapter VIII, which is the largest section of the book, occupying about 500 pages, contains an introduction on the Direct Use of Latex in Industry, followed by various sections containing, as in the previous chapters, abstracts of patent and technical literature dealing with various specific applications of latex.

Chapters IX, X and XI deal respectively with artificial latex; electro deposition of latex and the structure of rubber. In each of these chapters, a similar treatment is adopted *viz.* an introduction followed by lists of abstracts of patent and technical literature.

The subject matter, as stated by Professor Bruni in his preface, comprises 2490 abstracts of which 1887 are patents and 600 of scientific or technical papers.

The book is of considerable value to all scientific workers who are concerned with latex. Its principal value is as a book of reference, since, as has been indicated above, the principal contents consist of abstracts of patent and technical literature.

The chief criticism which the reviewer has to make is that some of the abstracts of the earlier technical literature might well have been omitted, since they are of no real value at this time, except historically.

In Chapter III on the Collecting and Extracting of Latex, quite a number of patents dealing with tapping tools are abstracted. These might have been omitted, since, as is well known, only about three or four types of tapping knives are now in use on rubber plantations. The majority of the patents for tapping tools, like many other patents, only rest in the dusty archives of various patent offices.

Further, an abstracted description of a tapping tool is not of much value without an illustration.

A few abstracts are misplaced *e.g.* in Chapter IV "The Preservation of Latex and Rubber" p. 114 abstract 346 deals with the treatment of latex to obtain specific properties in the prepared rubber.

Page 119 abstract 372 deals with the character and properties of Castilloa latex and refers chiefly to coagulants of this latex.

Page 123 abstract 383 deals with coagulation phenomena and should be included in Chapter VI.

Athough the author has abstracted articles appearing in the Agricultural Bulletin of the Federated Malay States and the Archief voor Rubber Cultuur of Netherlands India, he does not appear to have abstracted much information contained in the special bulletins or pamphlets on rubber published in these countries. This chiefly affects the question of priority of publication in relation to problems which have been investigated in both countries, since most of the information in these publications has been published separately in other journals and has been abstracted by the author from these journals.

In spite of these criticisms, the author is to be congratulated on the immense amount of time and labour which he must have devoted to this excellent compilation, which is of great value as a book of reference to those engaged in scientific work on behalf of either the rubber producer or manufacturer.

B. J. E.

Coir.

Report on the Attributes and Preparation of Coconut Fibre,
by S. G. Barker, Ph. D., D.I.C., F. Inst. P., M.I. Chem. E., F.R.S.E., F.Z.S., F.T.I.
Empire Marketing Board Bulletin No. 71, September, 1933.

This report is of definite local interest, dealing as it does, with the qualities and uses of a by-product of the copra industry, namely Coir, which is extracted from the husk of the coconut.

It is stated that "at present the whole year's production of coir fibre for spinning is about three and a half million tons. Actually only 100,000 tons are used, the remainder being wasted owing to the fact that no commercial use can be found for it. There is, therefore, an abundance of the raw material and the future of the industry would seem to lie in finding new uses for the fibre and carrying out research work to discover if it can be rendered comparatively cheaply into forms more favourable for utilisation in other directions then those at present ".

Extensive information is supplied in the report on the coconut palm and its habitat, and on the methods adopted by the raiats in the different tropical countries in the preparation of coir.

It is an axiom amongst workers engaged in scientific investigation of industrial processes and practice that there is always a good scientific basis for established industrial practice, and, although the methods of soaking and retting coconut husk in most tropical countries may be somewhat primitive, there are sound scientific reasons for each part of the process. The report discusses

these methods and their significance at some length, before passing on to the question of chemical and mechanical methods for quick retting of the husks.

Under this heading, five different modern processes are described and it is stated that the H. G. process with ionized oil. which is adaptable to either factory or co-operative village conditions, is now being developed and large-scale plant is already designed and installed in London. It is interesting to note that in this process use can be made of coconut oil, ionized and suitably treated.

In connexion with sorting the fibre into the market grades of "mat fibre" used in ropes, twines and matting, "bristle fibre" for brushes and brooms, and "curled fibre" for mattresses, stuffing upholstery and as a substitute for horse hair, mention is made of a method, put forward by a British firm of machine makers, for separating the classes of fibre mechanically and keeping distinct the separate qualities of the fibre.

A section is also devoted to utilisation of residues from fibre extraction and many useful suggestions for further work on this question are made.

The properties of coconut fibre are fully reviewed in a section which reveals the obvious uses of coir. For ropes it is to be recommended where elasticity or resistance to decay is desired, especially in ropes subject to the action of sea water. On the other hand, as a textile fibre it has been considered to be of little general value because of its coarseness, harshness, brittleness and colour, qualities which, however, are desirable in other directions. It is thought that chemically and mechanically retted coconut fibre opens up a new vista in the outlook for the future of coir. A new use of importance, which has already passed the experimental stage, is the use and preparation of protective lagging materials for underground pipes and cables. The superior durability and resistance to decay of coir, as well as its absorbent properties for pitch etc. indicate its utility as a road surface reinforcing medium and it is stated that experiments in this regard are now being organised.

The final chapters are concerned with manufacturing processes, and bleaching, along with remarks on the properties and uses of coconut shell.

The report is of considerable interest and value and should stimulate research into the possibility of increased utilisation of coir.

A. T.

Reports of the Field Branch for the Year 1932.

Department of Agriculture, S.S. and F.M.S.. Special Bulletin, General Series No. 15. 209 pp. 5 plates. Price 50 cents.

In accordance with what has now become established practice, the reports of the various officers of the Field Branch of the Department, for the year 1932 are published in Bulletin form.

The re-organisation of the Department has resulted in very much greater importance becoming attached to the work of the officers of this Branch than formerly was the case. The gradual systematisation of extension work, and the opening up in the majority of circles of Agricultural Stations and Test Plots, has greatly increased the activities and the utility of this section of the Department and most field officers have now under their charge a certain amount of experimental work in addition to instructional and inspectional activities.

In this respect, these services may now be regarded as having been brought into line with accepted standard practices in other parts of the world.

Through the courtesy of the administrations of the Unfederated States, it has been possible to include accounts of the work done by seconded agricultural officers in these territories, which, it may be pointed out, is, in most States, conducted along lines which have become standardised in the Straits Settlements and Federated Malay States, and the efforts in progress closely correlated thereto.

The reports give an idea of the many lines of work in progress and also afford a review of the agricultural conditions in each area.

On the present occasion, certain of the reports are illustrated by photographs indicating some of the undertakings operated by the Branch.

H. A. T.

List of Experiments at Present in Progress at the Government Experimental Plantation, Serdang.

Department of Agriculture, S.S. and F.M.S. Special Bulletin, General Series No. 16. 29 pp. Price 50 cents.

This publication is issued as a supplement to the the Guide to the Government Experimental Plantation, Serdang published in 1931.

It gives details of the large amount of experimental work in progress on a considerable number of crops.

The nature and scope of the experimental work in hand has been greatly expanded during the past two years. Its inception definitely marks the second stage in the history of the Plantation, whereby trials with possible crops to ascertain their suitability for cultivation have now become supplemented, and to an extent replaced, by definite experimental work. These experiments are designed to investigate cultural and manurial requirements and the methods of manipulating the produce of crops which have been found suitable for cultivation and which have to a greater or less extent entered into commercial cultivation.

The increasing number of, and area under, agricultural crops other than rubber in the Peninsula is one of the most interesting features of Malayan Agriculture at the present time, and in facilitating their development the Serdang Station can fairly lay claim to have played a useful and not unimportant part.

The present publication will, it is believed, prove to be a very necessary and useful adjunct in the hands of visitors to the Station.

For its compilation, Mr. J. N. Milsum, Senior Assistant Agriculturist in charge of the Station, with the other members of the Station Staff, are responsible.

H. A. T.

Departmental.

FROM THE DISTRICTS.

The Weather.

The cool wet weather continued during the first half of December practically throughout the Peninsula, heavy rainfall causing flooding in Kelantan and small floods in some localities along the lower portion of the Perak River. The second half of the month was warmer and fairly dry. While precipitation was up to the average for the month in many places, it was below average in Krian District, in Central Perak, on Cameron Highlands and on the east coast of Pahang.

Remarks on Crops.

Rubber.—The average price of rubber showed but little variation from that of November. The highest and lowest prices in dollars and cents per picul recorded during the month for rubber from small holdings were:—Smoked Sheet $12 to $17.95; Unsmoked Sheet $10 to $15.60; Scrap $1.50 to $7. The average Singapore prices are not available, but are known to be but little different from those for November. The Penang prices for Unsmoked Sheet ranged from $13.30 to $14.60 as compared with $12 to $14.20 in November.

The situation in respect of tapping showed but little change from that described for November. Wet weather interfered with tapping during the first half of the month, while in large portions of the States of Negri Sembilan and Pahang the padi harvest was a further factor contributing towards a reduced output of rubber from small holdings. On the other hand, in Johore, every effort was made to obtain the maximum production in order to meet anticipated expenses at the Mohammedan and Chinese New Year holidays.

In Kelantan, efforts made towards the improvement of native rubber are having a small though increasing effect. Another two small--holders have begun to use hand rollers for preparing sheet and there is increased interest in the use of acetic acid instead of alum as a coagulant.

Mouldy Rot disease continued to be in evidence during the wet weather, but there was some further increase in the use of approved disinfectants in certain areas.

Padi.—The price of padi at the Government Rice Mill, Bagan Serai, at $1.62 per picul, was the same as in November, and there was little change in the general range of prices throughout the country, these being 5 to 13 cents per gantang, except in Kedah, where prices fell considerably, more especially for the new crop now being reaped.

In the important padi-growing areas of Kedah, Province Wellesley, Krian and Malacca, crop prospects remain good. Harvest commenced in Kedah and the Province and was in full progress in several parts of Malacca.

In Pahang, the harvest was nearing completion in the greater portion of the riverine area, where the crop has, therefore, escaped damage from floods. The crop reaped is reported as being good on the whole. Harvest had also commenced in other parts of the State, with the exception of portions of Kuala Lipis District.

In certain localities in the inland districts of Selangor, the planting dates for the longer period varieties of padi were, contrary to departmental advice, so arranged that the harvest fell during the wettest period of the year and in the fasting month. The same is true of the planting dates in the Jelebu and Seremban Districts of Negri Sembilan. In all these areas, loss of crop has occurred owing to the wet conditions which often caused lodging. In Rembau District a good crop was being reaped.

In Kelantan, considerable damage was caused to the standing crop by floods. In Upper Perak, Kuala Kangsar and Larut Districts of Perak, planting has been late and prolonged; rats are more prevalent than usual and crop prospects are, in consequence, uncertain.

In Johore, Padi Planting Rules have been introduced by means of which dates can be fixed for the season's operations as in the Federated Malay States. These Rules should ensure better synchronisation of the season's work and, in consequence, more even ripening of the crop, thus reducing the loss caused by pests.

Coconuts and Copra.—There was again a slight decline in the price of copra which ranged from $2.55 to $2.60 in Penang and elsewhere from $1.50 to $3 per picul.

Interest among Malays in the preparation of improved copra is, on the whole, well maintained. New kilns were completed, or in course of erection, at Sungei Batu in Penang Island, Sungei Tontong in the Dindings and Kubang Ulu in Province Wellesley. In Krian, a good sample of copra has been made on the recently completed brick kiln at Tanah Kebun and work has been commenced on a second kiln on Jalan Bahru. In Pahang, the owners of the original mud-walled kiln at Temerloh have almost completed a second brick kiln and a kiln at Kertau has been completed, while a small mud-walled kiln is being built at Kuala Pahang.

In Selangor, owing to the fasting month, there has been an increased demand for nuts in the inland Districts which has been supplied from the coastal Districts.

Fruit.—It is reported that a crop of durians was being obtained around Manong in Kuala Kangsar District, but that rambutans were not yet ripe. In Selangor, there were good crops of durians, mangosteens and rambutans and smaller crops of minor fruits. Tree fruits were also ripe in the States of Negri Sembilan and Pahang. Durian fetched from 7 to 15 cents each in Central Perak and Negri Sembilan and 5 to 10 cents each in Western Pahang. Mangosteens sold for 45 to 50 cents a hundred in Negri Sembilan but only 25 to 30 cents

a hundred in Pahang; while in the former State, the price of rambutans was 50 to 80 cents a hundred.

A recent census of the area planted with fruit, other than pineapples and bananas, in Pahang shows a total area of 4,000 acres, including the fruit trees planted in holdings of mixed crops.

Coffee.—A heavy second crop of coffee was being harvested in Kuala Langat District of Selangor, where the price for beans was 19 to 20 cents per kati. The number of Malays manufacturing coffee in this District is increasing, while those who have been longer in the business were working overtime to cope with the supplies of cherry. In the Temerloh District of Pahang, coffee seed and seedlings have been supplied to Malays and Chinese for planting up new land. Should the present interest in this crop continue there will be a considerable increase in the area planted with coffee in this District during 1934. In one locality in Johore, small holdings have been planted with Liberian coffee which is showing good growth. Further planting in this locality is expected.

Seedlings of "Blue Mountain" coffee, grown from seed imported from Jamaica during the first half of 1933, were being transplanted into the field on one or two properties on Cameron Highlands. A further supply of seed has been ordered by this Department.

Arecanut.—These palms were yielding crops in most localities, but the price was very low, though varying considerably in different parts of the country. In Johore, sundried split nuts sold for 80 cents to \$3 per picul, in Selangor for \$2 to \$5 per picul and dried nuts from other centres at \$1.50 to \$3 per picul.

It is reported that, in a number of instances, arecanuts have been dried on copra kilns during wet weather in Batu Pahat District of Johore.

Tobacco.—Prices for sundried tobacco leaves have ranged for the most part from \$10 to \$30 per picul according to quality, but the top price in Malacca was \$35 and in Johore \$45 per picul, while in Penang Settlement it was only \$20 per picul.

There are no reports of any important changes in the planted area. A recent estimate places the total area planted with this crop in Pahang at 147 acres, yielding an average of 3 piculs of leaf per acre. Of this total, 111 acres are in Raub District.

Agricultural Stations.

At the Selama Agricultural Station, in the standard experiment on the manuring of annual crops, a much better growth was shown by gingelly planted on the plots which received 15 tons per acre of a leguminous cover crop, turned in 5 and 1 week respectively before planting, than on the plots receiving 15 tons of non-leguminous material turned in at the same intervals before planting. No marked differences were noticeable between the various sub-plots treated with inorganic fertilisers in this experiment.

Two cockerels and six pullets of each of the three breeds Rhode Island Red, White Leghorn and Light Sussex were received from England at the Tanah Rata Experiment Station, Cameron Highlands on the 18th December and were installed in the six runs recently prepared.

A severe outbreak of fowl typhoid in the neighbourhood resulted in the death of three Light Sussex pullets and one cockerel and one Rhode Island Red pullet at the Sungei Udang Station in Malacca.

At the Padi Experiment Station, Telok Chengai, Kedah, four strains of the long grained, Indian, 4-months, Kalyaman variety yielded over 500 gantangs per acre. An excellent crop of all other varieties was expected.

The State Agricultural Officer, Perak, and the Agricultural Officer, Krian, visited this Station, Gajah Mati Agricultural Station and Langgar Padi Test Plot on December 23rd.

Padi Test Plots.

The highest yields so far recorded from the Kajang Padi Test Plot in Selangor were obtained during the season just concluded; the three best strains being Padi Kelantan with 446, Nachin 27 with 438 and Radin Siak with 382 gantangs per acre. The high yields are attributed to the effect of ploughing.

Yields from the Kuang Padi Test Plot were, however, poor, owing to damage by the padi fly, *Leptocorisa* sp., and by birds while the grain was ripening. Of the 6½ months strains, Nachin 10 was the best with a yield of 242 gantangs per acre; while of the shorter term varieties, Radin Siak gave 210 gantangs per acre.

A party of 75 leading local padi growers, including the local headmen, visited the Briah Test Plot in Krian on December 4th. Another party of 200 local headmen and cultivators, accompanied by the District Officer, visited the Selinsing Test Plot in the same district on December 7th.

A demonstration for local headmen was held at the Pasir Puteh Experiment Station in Kelantan on December 5th and another at the Central Experiment Station, Kota Bahru, on December 20th.

School Gardens.

The final judging of the School Gardens in Penang Settlement was carried out during the month. This showed that the general standard of the gardens is improving.

Judging for the annual competition in the Negri Sembilan was also completed. The winning schools exhibited a very satisfactory standard of work, Senaling, the cup winner, being an excellent example of what can be achieved under school conditions.

In Malacca Settlement, there was a noticeable increase in the number of gardens reaching a very high standard and the selection of the winning garden was much more difficult than it has been in past years, owing to the uniformly

good results achieved by the first six or eight gardens. The best garden in Malacca was that of Melekek School.

Home Gardens Competitions.

Judging in the State of Negri Sembilan took place in Seremban and in Rembau and Tampin Districts. In the former, results were disappointing, but in the latter the competition produced some outstanding attempts to achieve the ideal *kampong* from the point of view of food production. Some attempts were, however, too ambitious and many of the gardens were of an uneconomic size. Those making a genuine attempt at gardening were selling surplus produce and appeared to be convinced of the economic value of the venture.

In Pahang East, there were 221 home gardens of which sixty obtained above average marks. The special prize in Pekan District was won by a boy of 16 years old and that in Kuantan District by a headman of Beserah.

Sawah Competition.

In the Seremban District of the Negri Sembilan, of 37 competing padi holdings, 12 were inspected for final awards. On the whole, the standard of maintenance was high and indicated in a striking manner what can actually be achieved by diligent and good management.

DEPARTMENTAL NOTES.

Tours.

The Chief Field Officer toured in Penang Settlement and the four northern Districts of Perak from December 8th to 13th inclusive. He inspected the Agricultural Stations at Bukit Mertajam, Selama and Kuala Kangsar; Titi Serong Padi Experiment Station; the Padi Station at Bukit Merah in Province Wellesley and Talang in Kuala Kangsar District and all Padi Test Plots in the area visited.

Appointment.

Mr. A. Thompson, Assistant Mycologist, Department of Agriculture, S.S. and F.M.S. has been appointed Mycologist, Department of Agriculture, S.S. and F.M.S. with effect from the 12th October, 1933, inclusive.

Leave.

Mr. D. H. Grist, Agricultural Economist and Editor, returned from leave on December 4th 1933.

Mr. F. C. Cooke, Copra Research Officer, returned from leave on December 8th, 1933.

MALAYAN AGRICULTURAL EXPORTS, NOVEMBER, 1933.

PRODUCT.	NET EXPORT IN TONS.				
	Year 1932	Jan.-Nov. 1932	Jan.-Nov 1933	Nov. 1932	Nov. 1933
Arecanuts ...	20,280	18,549	20,086	2,428	2,353
Coconuts, fresh† ...	108,123	200,588	94,102	9,981	7,701
Coconut oil ...	11,932	10,647	16,149	1,437	1,436
Copra ...	97,464	90,690	96,966	12,543	10,201
Gambier, all kinds ...	2,925	2,771	2,294	225	267
Palm kernels ...	1,248	1,098	1,813	125	100
Palm oil ...	7,892	7,300	10,466	1,010	1,219
Pineapples, canned ...	66,291	60,510	54,340	3,807	3,069
Rubber § ...	417,137	376,163	414,631	34,031	41,843
Sago,— flour ...	10,267	9,293	6,034	1,815	2,247
„ — pearl ...	3,128	2,953	2,277	237	360
„ — raw ...	4,148*	3,833*	3,917*	503*	435*
Tapioca,— flake ...	9,028	8,346	9,185	500	494
„ — flour ...	392	88	370*	220	188*
„ — pearl ...	19,977	18,567	16,247	2,003	1,679
Tuba root ...	165½	114½	498	9	62

† hundred in number. § production. * net imports.

Statistical.

MARKET PRICES.

December 1933.

Rubber.—The market price of rubber has been steady during the month, opening at 13 14/16 cents per lb. for Spot loose in Singapore and closing at 14 cents per lb. The average price for the month was 13 9/16 cents per lb. in Singapore, 4 3/16 pence in London and 8 11/16 cents Gold in New York as compared with 13¼ cents, 4 3/32 and 8½ cents Gold respectively in November.

Palm Oil.—The course of the market Liverpool/Continent during December on a basis of 5 per cent. f.f.a., c.i.f. was as follows:—December 2nd £15.5.0 per ton net, December 9th £15.0.0 per ton net, December 18th £15.0.0 per ton net, and December 27th £15.0.0 per ton net.

Prices in the U.S.A. landed weight per pound in bulk c.i.f. New York/Philadelphia were 2.80 cents Gold on the 2nd December, 2.75 cents Gold on the 9th December, 2.75 cents Gold on the 18th December and 2.75 cents Gold on the 27th December.

The price of palm kernels Fair Average Malayan Quality c.i.f. landed weight on the Continent was Shillings 7/6 per cwt. on December 2nd; Shillings 7/6 per cwt. on the 9th December; Shillings 7/6 per cwt. on December 18th and Shillings 7/6 per cwt. on the 27th December.

Copra.—There was a slight fall in price during December. The highest Singapore price for Sundried during the month was $3.15 per picul, and the lowest price $3.00 per picul, the average price per picul being $3.08 as compared with $3.21 during November.

The mixed quality averaged $2.40 per picul as compared with $2.52 per picul in November.

Coffee.—The price at Singapore for Sourabaya Coffee as in the previous month continued steady, prices ranged according to grade, from $16 to $18 per picul. Palembang coffee averaged $12.25 per picul during the month, being quoted at $12 on the 1st and $12.25 on the 29th; the average figure for November was $12.31.

Arecanuts.—Palembangs averaged $1.96 per picul and Bila Whole $2 per picul as compared with $1.98 and $2 per picul during November. The range of Singapore prices for other grades was Split $2.50 to $4 per picul; Red Whole $3 to $4.50 per picul; Sliced $5 to $7.50 per picul and Kelantan $3 to $3.50 per picul.

Rice.—The average wholesale price of Siam No. 2 ordinary rice per picul in Singapore in November was $3.31 as compared with $3.48 in October. No 1 Rangoon rice averaged $3.10 per picul in Singapore in November, the average price for October being $2.88 per picul.

The average retail market prices in cents per gantang of No. 2 Siam rice in November were:—Singapore 24, Penang 27, and Malacca 27, as compared with 24, 20 and 27 respectively in October.

Tea.—During November the average price quoted in London for Malayan Tea was Shillings 1/0.99. Average prices during November for tea consignments from other countries were as follows: Ceylon, Shillings 1/3.76; Java Pence 11.59; Indian Northern, Shillings 1/1.19 and Indian Southern, Shillings 1/1.29.

Gambier.—The price of Block Gambier remained steady during December at $4 per picul, Cube No. 1 averaged $6.50. Corresponding figures for November were $4 and $7.25 respectively.

Pineapples.—Values increased slightly during December, the average Singapore price per case being as follows:—Cubes $3.14, Sliced Flat $3.04, and Sliced Tall $3.10, as compared with $3.02, $2.94 and $3.07 respectively during November.

Tapioca.—The price of Flake Fair averaged $4.45 per picul as compared with $4.06 in November. Pearl Seed averaged $5.42 per picul a slight increase on the November price of $5.17, and Pearl Medium averaged $5.70 per picul, the average price being $5.50 in the previous month.

Sago.—Pearl-Small Fair increased in price during December, averaging $3.90 per picul during the month; the price was $3.65 in November. Flour-Sarawak Fair averaged $1.79 per picul this being a slight fall in value as compared with November average of $1.80½.

Mace.—Prices fluctuated somewhat during December, the average for the month for Siouw being $64.00 per picul, and $42.00 per picul for Amboina.

Nutmegs.—There was a slight increase in the price of 110's during the month as compared with November prices the average being $19.60 per picul, 80's fell slightly in value, averaging $24.40 per picul.

Pepper.—Average Singapore prices during December were as follows:—Singapore Black $13.30 per picul; Singapore White $22.60 and Muntok White $23.60; the corresponding figures for November were $13.00, $22.25 and $22.87 per picul respectively.

Cloves.—There was a slight fall in the price of Zanzibar during the month as compared with November price, the average price was $38.00 per picul during December. Amboina remained steady as in the previous months at $45.00 per picul. These are nominal prices.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co., Ltd., Kuala Lumpur, and the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY.*

For November, 1933.

Malaya.—Gross foreign imports of rice (including stocks available for re-export) during November 1933, amounted to 51,261 tons, as compared with 52,474 tons in November 1932, of which 49 per cent. were consigned to Singapore, 25 per cent. to Penang, 7 per cent. to Malacca, 16 per cent. to the Federated Malay States and 3 per cent. to the Unfederated Malay States.

Of these imports, 55 per cent. were from Siam, 40 per cent. from Burma, 4 per cent. from Indo-China and 1 per cent. from other countries.

Total foreign exports of rice from Malaya in November 1933, were 13,875 tons (including 171 tons local production) as compared with 17,553 tons in November 1932.

Of these exports 72 per cent. were consigned to Netherlands India and 28 per cent. to other countries.

Net imports for the period January to November 1933, were 395,367 tons as compared with 370,105 tons during the same period for 1932, an increase of 6.7 per cent.

India and Burma.—Total foreign exports of rice during October 1933, were 91,000 tons as compared with 99,000 tons in the previous month and 72,000 tons in October 1932, a decrease of 8 per cent. in respect of the previous month and an increase of 26 per cent. in respect of the same period in the previous year.

Total exports during the period January to October 1933, were 1,655,000 tons as compared with 1,866,000 tons for the corresponding period of 1932, a decrease of 11 per cent.

Siam.—Exports (approximate) during November 1933, amounted to 113,685 tons as compared with 135,908 tons in November 1932, an increase of 20 per cent.

Netherlands India, Java and Madura.—At the end of October 1933, the area harvested amounted to 8,820,000 acres, an increase of 131,000 acres or 1 per cent. as compared with the corresponding date of 1932: the area damaged was 441,000 acres an increase of 86,000 acres or 24 per cent. as compared with 1932, and additional plantings awaiting harvesting amounted to 1,255,000 acres an increase of 235,000 acres or 23 per cent. The total acreage at the end of October 1933, amounted to 10,516,000 acres, an increase of 452,000 acres or 4 per cent. as compared with the same period in 1932.

Imports of rice into Java and Madura during January to September 1933, totalled 104,344 tons, a decrease of 9,456 tons or 8 per cent. as compared with the same period of 1932.

Imports of rice into the Outer Provinces during January to September 1932, amounted to 192,702 tons.

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* Abridged from the Rice Summary for November 1933, compiled by the Department of Statistics, S.S. and F.M.S.

French Indo-China.—Entries of padi at the port of Cholon from January to November 1933, amounted to 1,034,000 (metric) tons, a decrease of 14,000 tons or 1 per cent. as compared with the same period of 1932.

Exports of rice from Saigon for the period January to November 1933, totalled 1,162,000 tons, an increase of 72,000 tons or 7 per cent. as compared with the corresponding period of 1932.

Ceylon.—Imports for the period January to October 1933, totalled 358,626 tons, a decrease of 13,193 tons on the imports for the same period of 1932.

Of these imports 19 per cent. were from British India, 81 per cent. from other countries.

Europe and America.—Quantities of rice shipped from the East were :—

(*a*) To Europe for the period January 1st to November 16th, 1,180,759 tons, an increase of 252,370 tons or 27 per cent. as compared with the same period of 1932. Of these shipments 47 per cent. were from Burma, 2 per cent. from Japan, 43 per cent. from Saigon, 7 per cent. from Siam and 1 per cent. from Bengal, as compared with 53 per cent. from Burma, 3 per cent. from Japan, 36 per cent. from Saigon, 5 per cent. from Siam and 3 per cent. from Bengal in 1932.

(*b*) To the Levant, period January 1st to October 21st 1933, 22,989 tons, a fall of 24,156 tons or 51 per cent. as compared with the same period of 1932.

(*c*) To America and the West Indies for the period January 1st to October 13th 1933, 141,352 tons, an increase of 28,567 tons or 25 per cent. as compared with the same period of 1932.

MALAYA RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING NOVEMBER, 1933.

STATE OR TERRITORY	Acreage of Tappable Rubber end 1932	ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		ESTATES WHICH HAVE PARTLY CEASED TAPPING		Total (3) + (5)	Percentage of (7) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
STRAITS SETTLEMENTS :—							
Province Wellesley	44,734	1,397	3.1	7,479	16.7	8,876	19.8
Dindings	6,969	209	3.0	762	10.9	971	13.9
Malacca	111,780	4,822	4.3	16,978	15.2	21,800	19.5
Penang Island	1,635	626	38.4	205	12.5	831	50.8
Singapore Island	28,269	9,730	34.4	5,139	18.2	14,869	52.6
Total S.S. ...	193,387	16,784	8.7	30,563	15.8	47,347	24.5
FEDERATED MALAY STATES :—							
Perak	250,951	5,200	2.1	35,428	14.1	40,628	16.2
Selangor	308,379	7,595	2.5	41,092	13.3	48,687	15.8
Negri Sembilan	228,541	7,342	3.2	20,824	9.1	28,166	12.3
Pahang	38,141	6,139	16.1	5,596	14.6	11,735	30.7
Total F.M.S. ...	826,012	26,276	3.2	102,940	12.4	129,216	15.6
UNFEDERATED MALAY STATES :—							
Johore	325,747	23,597	7.2	34,413	10.6	58,010	17.8
Kedah (a)	114,551	3,784	3.3	7,370	6.4	11,154	9.7
Kelantan	21,175	7,840	37.0	2,303	10.9	10,143	47.9
Trengganu (b)	4,352	Nil	Nil	2,072	47.6	2,072	47.6
Perlis (a)	957	177	18.5	468	48.9	645	67.4
Total U.M.S. ...	466,782	35,398	7.6	46,626	10.0	82,024	17.6
TOTAL MALAYA ...	1,486,181	78,458	5.3	180,129	12.1	258,587	17.4

Notes :— (*a*) Registered companies only and are rendered quarterly.

(*b*) Registered companies only.

The above table together with a Summary, was prepared and published by the Statistics Department, S.S. and F.M.S. in December, 1933.

MALAYA RUBBER STATISTICS — TABLE I

Stocks, Production, Imports and Exports of Rubber, including Latex, Concentrated Latex and Revertex, for the month of November 1933 in Dry Tons.

Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
	Ports	Dealers	Estates of 100 acres and over	during the month	January to Nov. 1933	during the month	January to Nov. 1933	during the month: Foreign	during the month: From Malay States & Labuan	January to Oct 1933: Foreign	January to Oct 1933: From Malay States & Labuan	during the month: Foreign	during the month: Local	January to Nov. 1933: Foreign	January to Nov. 1933: Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Malay States :—																		
Federated Malay States ...	...	13,616	12,017	12,174	124,437	10,092	99,818	Nil	Nil	Nil	Nil	16,542	6,404	161,825	65,291	...	12,983	11,958
Johore ...	...	3,000	3,056	3,926	39,913	4,944	48,317	Nil	2	Nil	121	1,530	6,958	15,470	72,443	...	3,196	3,244
Kedah ...	...	437	2,121	2,733	26,388	1,652	15,212	Nil	Nil	Nil	Nil	1,351	2,852	13,832	28,296	...	506	2,234
Perlis ...	...	16	10	8	92	33	168	Nil	Nil	Nil	Nil	Nil	32	Nil	270	...	21	14
Kelantan ...	...	426	207	200	2,029	452	5,823	126	Nil	1,049	Nil	101	813	908	7,777	...	309	188
Trengganu ...	...	55	50	180	1,548	90	773	Nil	Nil	Nil	Nil	Nil	270	Nil	2,321	...	55	50
Total Malay States	...	17,550	17,461	19,221	194,407	17,263	170,111	126	2	1,049	121	19,524	17,329	192,035	176,398	...	17,070	17,688
Straits Settlements :-																		
Malacca ...	...	3,197	1,289	1,490	14,777			1		15		3,829		44,955		...	2,943	1,285
Province Wellesley	...	1,049	689	551	5,737			Nil		Nil						...	1,307	588
Dindings ...	...	43	177	109	1,101	3,036	26,778	Nil	17,414	Nil	177,063	7,217	Nil	72,064	Nil	...	53	202
Penang ...	1,750	5,527	11	10	59			1,542		9,423						3,995	5,764	9
Singapore ...	4,741	30,410	125	164	1,661			13,179		103,457		24,029		206,779		2,542	31,662	123
Total Straits Settlements	6,491	40,256	2,291	2,324	23,335	3,036	26,778	14,722	17,414	112,895	177,063	35,075	Nil	323,798	Nil	6,537	41,729	2,207
Total Malaya	6,491	57,806	19,752	21,545	217,742	20,299	106,889	14,848	17,416	113,944	177,184	54,599	17,329	515,833	175,398	6,537	58,799	19,895

TABLE II
DEALERS' STOCKS. IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
20	21	22	23	24	25	26
Dry Rubber	9,499	26,778	4,830	4,130	1,285	177
Wet Rubber	3,484	4,884	934	173	1,911	329
Total ...	12,983	31,662	5,764	4,303	3,196	506

TABLE III
FOREIGN EXPORTS

PORTS	For month	January to Oct. inc. 1933
Singapore ...	33,458	318,141
Penang ...	12,202	116,770
Port Swettenham.	7,968	69,901
Malacca ...	971	11,021
Malaya ...	54,599	515,833

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	during the year 1933
Malay States ... / Straits Settlements	40,486	405,419
Malaya ...	40,486	405,419

Notes:—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption. *i e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + 12 tons local consumption during the month —[2]—[3]—[4]—[5]—[9]—[10]. For the Straits Settlements, Columns [9] and [10] represent purchases by dealers from local estates of less than 100 acres. reduced by 15 % to terms of dry rubber.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15; wet sheet, 25; scrap, lump, etc., 40; stocks else where are in dry weights as reported by the dealers themselves.

4. Domestic exports are estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign exports of the later month, the foreign exports of the Malay States being domestic production.

5 The above, with certain omissions, is the Report published by the Registrar-General of Statistics. S.S. and F.M.S., at Singapore on 22nd December 1933.

METEOROLOGICAL SUMMARY, MALAYA, NOVEMBER, 1933.

Locality	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total	Total	Most in a day Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total	Daily Mean	Per cent
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.								
Railway Hill, Kuala Lumpur, Selangor ...	89.4	72.0	80.7	92	70	84	74	83.2	84.3	6.44	163.6	1.24	21	16	7	9		129.30	4.31	36
Bukit Jeram, Selangor ...	87.0	72.1	79.5	90	70	83	75	82.9	85.2	8.41	213.6	1.54	21	19	3			136.75	4.56	38
Sitiawan, Perak ...	87.8	72.6	80.2	93	70	79	75	83.3	84.9	7.99	203.0	1.52	16	11	4			146.70	4.89	41
Temerloh, Pahang ...	86.0	72.5	79.2	90	71	78	74	82.8	85.2	5.85	148.6	0.77	24	22		1	1	125.55	4.19	35
Kuala Lipis, Pahang ...	85.4	71.4	78.4	90	70	75	73	82.0	83.9	14.42	366.3	2.71	27	24	2	24		112.80	3.76	31
Kuala Pahang, Pahang ...	83.5	73.5	78.5	88	71	77	76	81.7	83.7	21.54	547.1	4.32	24	22	1			140.70	4.69	39
Mount Faber, Singapore ...	85.2	72.4	78.8	89	70	79	74	80.1	81.6	9.12	231.7	3.89	23	17	5			99.15	3.31	27
Butterworth, Province Wellesley ...	85.0	73.2	79.1	89	70	77	76	82.2	84.2	9.72	246.9	1.78	19	16	1		1	145.15	4.84	41
Bukit China, Malacca ...	84.3	73.3	78.8	90	71	80	75	81.6	83.2	4.13	104.9	0.79	19	12				130.40	4.35	36
Kluang, Johore ...	85.8	71.5	78.7	90	70	79	73	80.5	81.6	15.42	391.7	4.36	23	16	1	6		105.10	3.50	29
Bukit Lalang, Mersing, Johore	83.3	71.9	77.6	89	70	76	73	80.0	81.0	24.58	624.3	5.39	29	25	1	1	1	112.35	3.75	31
Alor Star, Kedah ...	85.7	72.7	79.2	90	70	76	75	83.1	84.8	7.75	196.9	2.68	17	14	6	1		138.55	4.62	39
Kota Bahru, Kelantan ...	82.8	72.7	77.7	91	71	74	75	80.8	83.4	39.57	1005.1	7.24	24	22				120.55	4.02	34
Kuala Trengganu, Trengganu	83.2	72.3	77.7	89	70	76	74	80.1	82.0	26.50	673.1	3.46	24	20			1	118.90	3.96	33
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. Pahang ...	71.2	61.8	66.5	78	59	63	64	70.9	71.5	13.45	341.6	1.76	26	24	1	23		85.50	2.85	24
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	70.7	57.6	64.1	73	52	64	61	69.3	69.6	12.12	307.9	2.15	25	23		1	3	86.30	2.88	24
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	70.5	58.9	64.7	74	57	62	61			12.14	308.4	2.18	25	23		2	3	91.30	3.04	25

Compiled from Returns supplied by the Meteorological Branch, Malaya

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THE

Malayan Agricultural Journal.

FEBRUARY, 1934.

EDITORIAL.

Agriculture in Netherlands India.

In the present number of this journal, prominence is given to an abstract of a recent publication—"The Export Crops of Netherlands India in 1932". Abstracting this bulletin at such length is justified for several reasons. In the first place, Malaya cannot afford to ignore the importance of a country which can claim to satisfy, to the following extent, the world's demand for a number of important products such as rubber 29 per cent., sugar 11 per cent., tea 18 per cent., cinchona 93 per cent., copra 29 per cent., sisal 29 per cent., kapok 79 per cent., and pepper 75 per cent.

Secondly, the publication is an excellent review of the agricultural enterprise—both as large scale production and on small holdings—in the country to which it refers. With the increasing diversification of agriculture in Malaya, reliable knowledge of what is being successfully accomplished in Netherlands India cannot but prove of great value. We also venture to predict that the many readers of the *Malayan Agricultural Journal* in countries outside Malaya will find this abstract of interest and value.

It is regretted that it has been impossible to print the abstract as submitted for publication, owing to limitations of space in the journal. The reader will, however, with the aid of the abstract, be able to consult the original bulletin—which is in the Dutch language—with ease and to abstract for himself more detailed figures than are here given, and to refer to many other crops of perhaps less importance in Malayan agriculture, than are treated in the abstract.

No attempt is here made to convert figures of metric weights and areas into English equivalents. At the end of the abstract, however, will be found a conversion table, by the use of which the reader will be able to convert such figures for any crop as he may desire.

Attention must again be drawn to the original publication, which is a mine of information. It demonstrates the diversity and value of agricultural enterprise in Netherlands India, which places the welfare of the people of that country in an impregnable position, minimising the effect of low market prices by alternative sources of livelihood and rendering them more self-reliant in the matter of satisfying domestic needs from local resources.

Fruit Propagation. The accusing finger is often levelled at the poor quality of fruit grown in Malaya. It is pointed out that supplies are uncertain and that the quality of many varieties is irregular and very frequently, inferior to the produce of other countries.

Scientific improvement is necessarily slow, owing to the length of time which must elapse by reason of the fact that most fruit trees take many years to reach maturity. Practical improvement is retarded because of the conditions under which fruit is usually grown in Malaya. The bulk of supplies originate from small holdings where, more frequently than not, trees of widely dissimilar nature are mixed and where effective selection of stock is generally entirely neglected.

The solution of these problems leads us along many avenues of research. Not only have we to carry out scientific work on the improvement of stock, but to ensure that by improved planting methods and education, the native may take full advantage of any superior varieties of fruit trees that are evolved.

While the organisation for the latter desideratum is not being overlooked, attention is being given to a study of existing fruits and steps are being taken towards their improvement by selection and other methods. An article on "The Propagation of Fruit Trees by the Etiolation Method", which is included in this number, describes the adaptation of the etiolation method to local conditions and its use and value in perpetuating desirable qualities in a number of local fruits.

The possibility of employing vegetative propagation over a wider range of fruit trees is receiving attention and will result in more planting material becoming available of trees which can be guaranteed to reproduce faithfully the good qualities of the parent stock.

Storage of Oil Cakes. One of the early results of the recent imposition of duties on various edible oils imported into Malaya, and of a smaller duty on the import of the raw material from which such oils are expressed, has been considerably increased activity in the local production of such oils. In particular, this applies to coconut and groundnut oils.

One of the main difficulties regarding local oil production has been the disposal of the residual cake—used for cattle food—in good condition. An article on the "Storage of Oil Cakes" in the present number records the results of an investigation on this subject.

The writer shews that while there are only small changes in the oil content in storage, there is an increase in acidity of the oil, except in the case of the by-product from the milling of parboiled rice.

A marked increase of acidity will affect both the palatability and digestibility of the oil cake. It is suggested, therefore, that it is preferable to rely upon purchases in small quantities at frequent intervals and where possible to purchase direct from the oil mill, in order that the material may be as fresh as possible.

As regards rice milling by-products, it is shewn that the parboiled products are superior to the white rice products, even though the colour of the latter, particularly the polishings, may be more attractive.

Original Articles.

THE PROPAGATION OF FRUIT TREES

BY

J. LAMBOURNE,
Assistant Agriculturist.

Introductory.

The propagation of fruit trees by what has been described as the "etiolation method" is new to Malaya, but has been in use for some years at the East Malling Research Station, Kent, England. The method was evolved some years ago for the purpose of propagating deciduous fruit trees. The reason for adopting the method was due to the fact that it had long been apparent that stocks on which fruit trees were grafted could not be relied upon to behave uniformly, the consequence being variation in vigour and fruitfulness of resulting trees. Stocks for certain purposes were raised from seed, while for other purposes vegetatively produced stocks were used. There was always considerable variation in the performance of seedling stocks and those produced by vegetative means were not found to be much better in this respect. Consequently, some method by which clones of stocks which would give a uniform performance could be propagated vegetatively was necessary.

It was early apparent that certain desirable fruit tree stocks were not easily rooted by ordinary methods and the etiolation method, which is a modification of layering, was brought into use and has proved successful for the purpose of raising apple, plum and cherry stocks.

A visit was paid to East Malling by Mr. J. N. Milsum while he was on leave in 1931-32, and on his return to Malaya, experiments were commenced with a view to propagating tropical plants such as tea, coffee, and fruit trees, by this method. The success so far attained in the propagation of tea has been published recently, and in the present article it is proposed to give the results so far attained with the propagation of fruit trees by this method.

Methods of Propagation.

Fruit trees have been propagated by vegetative means from very early times and these methods include grafting, budding, cuttings, layering and marcottage. The methods of grafting and budding have for their object the building up of a tree from two different plants, *i.e.* the stock or rooting portion and the scion or portion grafted or budded upon the stock. The influence which the stock has upon the scion makes it desirable that the former should show as little variation as possible so that, with experience, the performance of any particular tree grown upon it can be judged, within narrow limits. This can

only be attained by raising stocks by vegetative means. Considerable investigation is necessary, however, before these methods can be adopted for tropical fruit trees.

The propagation of certain fruit trees by means of cuttings and marcottage with the object of producing trees growing upon their own roots is well known in Malaya. Before the method of propagation about to be described can be carried out, it is necessary to use these methods, more especially marcottage, for the production of plants for laying down in etiolation beds.

It is a well known fact that the seedlings of most fruit trees vary considerably, both in the quality and quantity of fruits produced; therefore, if trees having the desirable characters of the parent are to be raised, vegetative methods of reproduction are desirable. Indeed, for certain fruits such as the seedless orange, or the pomelo, it is the only possible method of reproduction. Another advantage to be derived from the vegetative propagation of fruit trees is early maturity. Fruit trees produced by marcottage bear fruits earlier than seedlings of the same species.

The method of propagation used at East Malling has been recently described by Milsum and Marsh and is as follows:—

"The plants required to be propagated are planted in rows each plant being placed obliquely in the soil at an angle of 35° to the horizontal. When sufficiently established, the young trees are laid and pegged down in shallow trenches a few inches below the ground level. As shoots appear from the stem and lateral branches, an inch or so of soil is placed over the entire tree, the growing shoots have thus to ascend through a layer of soil. As growth proceeds, further soil is added until a layer of earth 4—6 inches in depth covers the base of the shoots. The portion of the stem below the soil receives no light and becomes etiolated. This condition is favourable to rooting which occurs freely in the blanched portion of the stem of the shoot below the soil."

It was early apparent that certain modifications of the above procedure would be necessary locally owing to the fact that the plants to be dealt with are evergreen and nearly always in a state of active growth. The temperate fruit trees on which this method of propagation is carried out at East Malling are deciduous and are pegged down in winter when the trees are dormant. The return to active growth in the spring results in the production of vigorous shoots which easily push through the soil. It was found that when certain tropical fruit trees were treated in this way, the branches died back; it was therefore necessary to modify the above procedure.

The Methods adopted at the Central Experiment Station, Serdang.

As stated above, it is necessary in the first place to procure marcots of the fruit trees which it is desired to propagate. To accomplish this a suitable branch with firm, well-ripened wood, is selected. A ring of bark 1—1½ inches wide is removed from just below a node and to this is applied a compost of

leaf mould, soil, sand, and cattle droppings mixed together and moistened so that it can be pressed into a ball. This is secured to the branch with a wrapping of coconut fibre tied tightly with wire, twine or other tying material that will last for a few months under moist conditions. The ball of soil is kept moist until the marcot has produced sufficient roots, when it may be removed from the tree. The time taken for roots to appear varies with different species of fruit trees but with the majority, from two to four months is necessary before the marcot is sufficiently well rooted. It is advisable not to cut the marcots from the tree too soon after roots first appear through the fibre, for, with some trees, such as the rambutan, marcots are difficult to establish unless they are well rooted.

Having removed the marcot from the tree, it should either be planted directly into the etiolation beds or temporarily established in pots. The latter procedure is the more satisfactory for such trees as the rambutan and chiku, owing to the fact that a large number of casualties are liable to occur unless the marcots are given careful attention until they are thoroughly well rooted.

Preparation of the Beds.

When preparing beds for the propagation of trees by the etiolation method the soil should be deeply cultivated and well supplied with organic matter. At the Central Experiment Station, Serdang, trenches 2½ feet wide and 2 feet deep are dug and in filling the trenches, farmyard manure is incorporated with the soil forming a good rooting medium and supplying the plants with nutrients.

The young trees are then planted in a single row in oblique positions about 35 degrees to the horizontal and well watered. When the plants become well established, they may be pegged down in shallow trenches an inch or so below the level of the bed. Young shoots, after varying intervals according to the variety of plant, will appear on the stems and lateral branches. When the shoots are from 4—6 inches in length they are covered at their bases with 2 to 3 inches of sandy soil. As growth proceeds, a little more soil may be added until the bases of the shoots are covered to a depth of 4—5 inches.

When the bases of the shoots have etiolated or blanched, they are then in a condition to produce roots and with some fruit trees such as the lime (*Citrus medica* var. *acida*) and citron this occurs naturally. Other fruit trees such as the chiku (*Achras Sapota*), pulasan (*Nephelium mutabile*) and the orange (*Citrus Aurantium*) are more difficult and it has been found necessary to twist wire round the base of each shoot near the point where it arises from the main stem or branch. This is done to induce callus formation which stimulates root development.

When the shoots are sufficiently well rooted, they are cut from the parent stem and taken carefully from the bed, avoiding, as far as possible, damage to the roots. The rooted plants are potted into bamboo joints or earthenware

CITRON, *Citrus medica L.* A pegged-down plant showing etiolated shoots.

pots and kept under dense shade and in moist conditions until they are well rooted, when they are gradually hardened by reducing the shade. They are then ready to plant into their permanent positions in the field.

Results of Experiments.

Up to the present, experiments with this method of propagation in Malaya have only been carried on for a short time and with comparatively few species of fruit trees. The first beds were laid down at the Central Experiment Station, Serdang, in July 1932, when marcots of the chiku, a large lemon-shaped lime. and a large type of orange were prepared. These plants were pegged down and covered with soil too early, with the result that, instead of shoots appearing through the soil, the branches died back. When this was noticed the plants were uncovered. This treatment enabled both the lime and the oranges to survive, but the majority of the chiku plants died.

Later, in December 1932, additional beds were laid down with marcots of the pulasan, lime and citron, following in February 1933, by rambutan (*Nephelium lappaceum*), jambu betek (*Eugenia* sp.) and the avocado pear (*Persia gratissima*).

The early mistake of completely covering the plants was avoided. The plants were allowed time to become thoroughly established in the beds before they were pegged down and the bases were not covered until shoots had attained a length of several inches.

The lime and citron produced roots freely so that rooted plants were taken from the beds four months after planting and within a month of covering the shoot bases.

The pulasan and avocado pear produced roots fairly easily when the shoot bases were ring-wired. The chiku, however, was more difficult, but rooted shoots were obtained from the surviving plants in the first beds laid down although this did not occur until nearly a year had elapsed after planting. The same applies to the large orange. That these two fruit trees can be made to produce roots in this way is encouraging and given proper treatment it is hoped that rooted plants will be obtained in a shorter time.

The rambutan and jambu betek beds were laid down with marcots taken directly from the parent trees. This method of planting was successful for the latter, but the former were more difficult to establish and only a few survived. A few rooted shoots have been taken from the jambu betek but not, so far, from the rambutans, owing to the length of time these plants have taken to become established.

Other fruit trees which have been laid down in nurseries include the Mandarin orange (*Citrus nobilis*) and the Villa-grande lemon, but as these have been planted only a short time no results have been obtained as yet.

Conclusions.

The etiolation method of propagation has proved successful for a number of fruit trees and also for tea, and it appears possible that this method can be adopted for a number of woody plants that are difficult to propagate by other means.

The advantage of this method of propagation is that once an etiolation bed has been established, a constant supply of young plants can be obtained. To attain this end, however, care should be taken not to remove every shoot that produces roots but to leave a sufficient number for laying down in the future, so that the bed may always be well furnished with rooted plants.

The preliminary work of collecting suitable material for the laying down of beds takes time. It is unsatisfactory to put down plants which, if rooted successfully, will give planting material of unknown or inferior quality. Care should, therefore, be taken to select for this purpose only parent trees which are known to produce good quality fruits.

It is too early to state how trees propagated by this method will thrive when planted out, but there appears to be no reason why they should not behave in a similar manner to trees propagated by marcottage or cuttings.

Summary.

1. The etiolation method of propagation and the reasons for its adoption has been discussed.
2. The methods used at East Malling is given, and also some modifications which have been found expedient when applying it to tropical fruit trees in Malaya.
3. The methods adopted at the Central Experiment Station, Serdang, are given and the results, so far obtained, are discussed.

References.

1. R. G. Hatton, M.A., Director, East Malling Research Station. "Masters' Memorial Lecture, 1929—Stock and Scion Relationship", *Journal of the Royal Horticultural Society*, Vol. LV, 1930, p. 169.
2. J. N. Milsum and T. D. Marsh, "The Propagation of Tea from Etiolated Shoots", *Malayan Agricultural Journal*, July 1933, p. 310.

STORAGE OF OIL CAKES

BY

C. D. V. Georgi,

Acting Agricultural Chemist.

Introductory.

In view of the importance of oil cakes and meals as ingredients of rations for feeding animals, an investigation has been carried out to ascertain the period during which such materials can be stored, using the oil content and the acidity of the extracted oil as an indicator of the storage qualities.

It is realised that the present investigation can only be regarded as preliminary as far as the general question of the storage qualities of such materials is concerned, since the experiments were confined to oil cakes and meals from local sources.

Collection and Storage of Samples.

The materials used for the investigation included the following:—

(*a*) Rice Milling By-Products
- (i) White Cargo Bran
- (ii) White Polishings
- (iii) Parboiled Cargo Bran
- (iv) Parboiled Polishings

(*b*) Coconut Cake

(*c*) Gingelly Cake

(*d*) Groundnut Cake.

Although rice milling by-products are not usually classified as oil cakes or meals, these by-products were included in the investigation, since they are often compounded with oil cakes or meals in stock rations.

As regards coconut cake, experiments were carried out with two samples of different oil content in order to ascertain whether the storage qualities of this cake as regards change of oil content and acidity of extracted oil could be correlated with the original content of the material.

The experiments with gingelly cake were also duplicated, the first sample being obtained from a wooden mill worked by bullocks, known locally as a *cheku*, while the second was taken from an iron press of a similar design to a *cheku*, but mechanically driven.

In all cases, comparatively large quantities of materials were stored; for example, sacks of rice milling by-products, in order to ensure that the amounts would be comparable with those that would be normally stored when using the materials for feeding purposes.

As regards the conditions of storage, the materials were stored in a dry shed, to which there was free access of air. Dry weather prevailed during the greater part of the period of storage.

Results of Analysis.

The results of analysis of the samples of fresh materials are shown in Table I. In addition to the figures for moisture, oil, and acidity of extracted oil, determinations of ash, crude protein and crude fibre were also made in order to collect additional data in respect of variations in composition of locally produced feeding stuffs.

The following observations are offered on the results:

(*a*) *Rice Milling By-Products.* The higher oil content of the parboiled polishings compared with the white polishings is interesting. As far as can be ascertained, this higher content is due partly to a concentration of the oil in the outer layers of the rice grain during the process of parboiling and partly to the smaller amount of polishing which this type of rice undergoes during preparation. The net result is a smaller weight of polishings of higher oil content.

In the case of the by-products from white rice, the high acidity of the oil is due to the presence in the grain of a fat-splitting enzyme (non-organised ferment) which is brought into contact with the oil during milling. This enzyme would be destroyed during the process of parboiling, thereby resulting in the oil in these by-products being much lower in acidity.

(*b*) *Coconut Cake.* The oil contents of the two samples differ by approximately 6 per cent.

In this connection, it may be pointed out that some local oil mills prefer to maintain a relatively high oil content figure, for example 15 per cent., for coconut cake. It is stated that such a cake, which feels slightly oily, finds a more ready local sale than one in which the oil content has been reduced to 10 per cent., and which is comparatively dry.

(*c*) *Gingelly Cake.* The oil contents of both samples are slightly higher than those recorded generally in literature. This is due to the lower efficiency of the *cheku* type of press compared with the modern cage-press.

(*d*) *Groundnut Cake.* The figure for the sample of groundnut cake calls for no comment.

An interesting feature of the analysis is the high protein content of the cake, which renders it useful as an ingredient for a mixed concentrate, in which it may be necessary to increase the protein content without unduly affecting the amounts of the other feeding constituents.

Results of Storage Experiments.

After a period of eight weeks, representative samples were drawn for analysis, a similar procedure being adopted after the expiry of a further period of four weeks, making a total storage period of twelve weeks.

The results of analysis, which were confined to determinations of moisture, oil and acidity of extracted oil, are shown in Table II. In order to make the results comparable, the figures for the oil contents have all been calculated on a moisture-free basis.

Except in the case of the samples of gingelly cake, the figures for the oil content indicate that, under normal conditions of storage, the decreases in this respect are small. In some cases, for example, the by-products from parboiled padi, the figures show practically no change.

Apart from the samples of by-products from parboiled padi, considerable increases in acidity of the extracted oils must be recorded in all cases. It is interesting to note, however, that the acidities show little tendency to increase during the second period of storage.

As regards the various materials the following comments are offered :—

(a) *Rice Milling By-Products.* The effect of parboiling on the resultant acidity of the extracted oil is clearly indicated both in the low acidity of the original oil and in the small rate of increase on storage.

(b) *Coconut Cake.* Although as regards oil content the storage qualities of this cake do not appear to be correlated with the original oil content of the material, the results of the acidity determinations indicate a greater increase for the cake with the higher oil content.

(a) *Gingelly Cake.* As regards gingelly cake, it is thought that the decrease in oil content and the marked increase in acidity can be ascribed to secondary changes resulting from the addition of sugar to the seed before pressing,* some of the sugar being retained in the cake.

The writer was informed that the objects of adding sugar were to improve the flavour of the oil, also to cause the mass to bind when pressing. From the point of view of the cake there is no doubt that the presence of sugar, which may amount to between 1 and 2 per cent., affects profoundly its storage qualities. Moulds will develop and these, in addition to increasing the acidity of the oil, may actually cause decomposition of the oil or fatty acids. Further, the rate of increase in the acidity of the oil may also be influenced by the presence in the material of various organic acids, for example, acetic acid, lactic acid and succinic acid, produced during the decomposition of the sugar.

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* Milsum, J. N. and Lambourne, J., Gingelly. *Malayan Agricultural Journal,* Vol. XXI, No. 9, September 1933, page 429.

(*d*) *Groundnut Cake.* The results of analysis indicate that, while there is a tendency for the oil content to decrease slightly on storage, the increase in acidity is not so marked as in the case of some of the other oil cakes, being comparable with that found for the sample of coconut cake with the lower oil content.

General.

Although not coming within the scope of this investigation, attention should be drawn to the fact that, after storage for 12 weeks, all the samples were infested with insects, notably *Tribolium castaneum* Hbst. This insect seems particularly attracted to the rice milling by-products.

In addition to *Tribolium,* the following insects were found associated with the coconut cake, *Sylvanus advena* Walk., *Sylvanus surinamensis* L. and *Necrobia rufipes* de Geer.

The gingelly cake and the groundnut cake were the least affected by insect attack, the only insect additional to *Tribolium* being *Ephestia cautella* Wlk.

A possible explanation for the absence of insect attack in the last two cases may lie in the hardness of the cakes. Both the gingelly cake and the groundnut cake were hard in comparison with the coconut cake, which was distinctly friable and which, therefore, it would be easy for insects to penetrate.

Remarks and Conclusions.

The results of analysis indicate that, while there are only relatively small changes in the oil contents on storage, marked increases in the acidities of the extracted oils occur, except in the case of the by-products from the milling of parboiled padi.

There is no doubt that with such marked increases in acidity, both the palatability and possibly the digestibility of the materials would be affected, with the result that, for oil cakes, it would appear preferable to rely upon purchases in small quantities at frequent intervals—for example every month—rather than to attempt to store for longer periods. Further, if possible, purchases should be arranged direct with an oil mill in order that the materials may be as fresh as possible.

As regards rice milling by-products, the figures clearly show the superiority of the parboiled products over the white rice products, even though the colour of the latter, particularly the polishings, may be more attractive.

In conclusion, the writer wishes to thank the Ho Hong Oil Mills Ltd., Singapore, for supplying the samples of coconut cake and groundnut cake.

The writer is also indebted to the Entomological Division for identification of the insects and to Inche Baba bin Ludek, who was responsible for all the analytical work connected with the investigation.

Table I.

Results of Analysis of Oil Cakes and Meals.

Constituent	Rice Milling By-Products				Coconut Cake		Gingelly Cake		Groundnut Cake
	White Cargo Bran	White Polishings	Parboiled Cargo Bran	Parboiled Polishings	Sample No. 1	Sample No. 2	Sample No. 1	Sample No. 2	
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Moisture ...	9.5	9.9	8.4	7.6	11.3	11.8	14.8	18.8	7.8
Oil ...	4.1	15.1	7.0	24.7	16.3	10.3	13.7	15.1	10.9
Crude Protein ...	7.4	12.3	8.9	15.9	17.3	17.6	30.5	28.7	47.9
Crude Fibre ...	19.3	4.5	19.1	7.0	9.0	7.3	5.9	6.6	3.6
Ash ...	12.2	5.9	12.4	7.5	4.8	5.2	10.4	9.2	4.8
Nitrogen-free Extract (by difference) ...	47.5	52.3	44.2	37.3	41.3	47.8	24.7	21.6	25.0
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Oil (calculated on moisture-free basis) ...	4.5	16.8	7.6	26.7	18.4	11.7	16.0	18.6	11.8
Acidity of Oil* (calculated as oleic acid) ...	19.8	10.8	3.6	1.7	9.1	7.8	8.9	4.9	8.9

* In the case of coconut cake the acidity of the oil is calculated as lauric acid.

Table II.

Variation in Oil Content and Acidity of Oil on Storage.

Nature of Material	Period of Storage	Oil (calculated on moisture-free basis) per cent.	Acidity of Oil (calculated as oelic acid) per cent.	Remarks
White Cargo Bran ...	Fresh 8 weeks 12 weeks	4.5 4.2 3.2	19.8 43.9 40.9	
White Polishings ...	Fresh 8 weeks 12 weeks	16.8 16.9 15.6	10.8 52.6 55.3	
Parboiled Cargo Bran ...	Fresh 8 weeks 12 weeks	7.6 7.9 7.8	3.6 6.9 9.9	
Parboiled Polishings ...	Fresh 8 weeks 12 weeks	26.7 27.2 26.4	1.7 3.1 4.4	
Coconut Cake (Sample 1) ...	Fresh 8 weeks 12 weeks	18.4 17.2 18.0	9.1 41.6 46.1	Acidities of oil calculated as lauric acid.
Coconut Cake (Sample 2) ...	Fresh 8 weeks 12 weeks	11.7 11.0 10.8	7.8 24.5 27.8	Acidities of oil calculated as lauric acid.
Gingelly Cake (Sample 1) ...	Fresh 8 weeks 12 weeks	16.0 15.3 13.2	8.9 61.2 61.4	
Gingelly Cake (Sample 2) ...	Fresh 8 weeks 12 weeks	18.6 14.7 14.0	4.9 51.5 55.0	
Groundnut Cake ...	Fresh 8 weeks 12 weeks	11.8 12.1 10.0	8.9 22.8 25.4	

Abstract.

THE EXPORT-CROPS OF NETHERLANDS INDIA IN 1932.

Bulletin No. 115 of the Central Bureau of Statistics of Netherlands India.

This annual bulletin is mainly limited to a review of agricultural activity, the object of which is production for the world market. Consequently, a sharp distinction is made between produce from estates, owned and managed by foreign capitalists, and native-grown produce. Whereas the bulk of the former is grown for the purpose of export, most of the native produce—rubber excepted—is grown for local consumption. Consequently the report deals with native agriculture only in respect of excess of production, available for export after requirements for local consumption have been satisfied. This excess, in most cases, is small in relation to the requirements of a Netherlands Indies population of about 64,000,000.

Climatic conditions during the year were rather abnormal. During the first half of the year rainfall was excessive, especially in the northern half and the eastern part of Java, whereas the second half of the year was abnormally dry.

Though the volume of exports of agricultural produce remained fairly constant during the years 1928-1932, the value, owing to the world depression, declined steadily as the following figures show.

Year	1928	1929	1930	1931	1932
Gs.	1,237,000,000	1,083,000,000	832,000,000	507,000,000	385,000,000

How heavily Netherlands India has been hit by the depression is shown by the following figures for the values of all exports—mining produce and other goods included—during these 5 years. The figures do not include Government exports, such as Banka tin.

Year	1928	1929	1930	1931	1932
Gs.	1,576,000,000	1,443,000,000	1,130,000,000	747,000,000	541,000,000

Comparison of the two sets of figures also shows the preponderance of agricultural produce in the total value of Netherlands Indies exports, other than Government exports.

The very steady decline of average market prices for the usual standard grades of the principal export crops during these five years is shewn in the following table.

Average Export Prices.

	Rubber per ½ kg.	Copra per 100 kg.	Sugar per 100 kg.	Coffee Robusta per 100 kg.	Tea per ½ kg.
	cents	Gs.	Gs.	Gs.	cents
1928 average	58½	24.03	14.61	88.93	63
1929 ,,	54	21.09	13.66	89.57	57
1930 ,,	30½	18.02	9.60	52.90	46
1931 ,,	15	11.22	8.06	36.30	30
1932 ,,	8½	8.24	6.28	39.03	17½
1932 December	8½	7.61	5.91	40.07	15½

The report gives a set of 3 diagrams, showing the values of estate produce and of native produce, exported from Java, Outer Provinces and the entire Netherlands Indies respectively. These show that the export of native produce from Java is only a small fraction of the export of estate produce from these sources. Considering that the population of Java is now over 43,000,000 and that native agriculture works primarily for local consumption, this is not surprising. Only slightly over 50 per cent. of the exports from the Outer Provinces is native produce. Of the total agricultural exports of the whole of Netherlands Indies about two-thirds is estate produce. For the five years 1928/1932 the figures have been—in percentages of totals—as below:

Produce		1928	1929	1930	1931	1932
Estate	...	65.3	63.5	68.8	67.5	64.2
Native	...	34.7	36.5	31.2	32.5	35.8

Another table gives the percentages of the contribution of estate and of native produce to the values of total exports from the whole of Netherlands India. The following taken therefrom is of local interest:

Percentage of value of total exports from Estates and Native holdings respectively, 1932.

		Sugar	Cocoa	Tea	Gambier	Rubber	Coffee	Tobacco (coarse)	Kapok	Copra and oil	Pepper
Estate	...	99	76	78	62	61	38	24	8	4	1
Native	...	1	24	22	38	39	62	76	92	96	99

Corresponding figures for the four previous years do not vary materially from those of 1932.

Though the production of some crops is enormous the quantity available for export, after satisfying local demands, is very small. Figures of local interest are shown below:

	World Exports	Netherlands India Exports		
	in metric tons 1931	in metric tons 1931	in percentages of world exports	
			1931	1930
Rubber, dry ...	818,537	254,519	31	29
Sugar ...	28,477,000	2,838,737	10	11
Coffee ...	1,675,000	67,990	4	4
Tea ...	409,000	78,742	19	18
Cinchona ...	11,616	10,625	91	93
Copra Oil ...	1,449,319	367,917	25	27
Palm oil, Kernels ...	774,291	73,587	10	7
Sisal etc. ...	239,540	70,278	29	29
Cocoa ...	560,706	1,406	0.2	0.2
Kapok ...	25,697	20,602	80	79
Pepper ...	45,907	31,756	69	75

The principal crops of estate produce are: rubber, sugar-cane, coffee, tea, cinchona and oil palms. Taking the 1921 figures as a basis, the planted areas and crops have increased in volume, to the percentages given below:

	Rubber	Sugar	Coffee	Tea	Cinchona	Oil Palms	
						Oil	Kernels
Area ...	157.9	105.8	95.3	148.4	107.5	541.6	
Production ...	243.5	154.6	140.6	239.6	95.3	4,191	12,035

Excepting cinchona, the yield per unit of planted area has, in every case, increased considerably during the last 12 years. Of these crops, sugar-cane alone requires annual planting.

Of the principal crops, grown by native producers, export figures only are given, except for tea, for which the figures for the total value of purchases of native-grown leaf by the estates are given. Taking the 1921 figures as a basis, the volume—not value—has meanwhile increased to the following percentages:

Tobacco*	Kapok†	Pepper†	Copra†	Coffee§	Tea‡	Rubber*
184.2	102	120.5	131.6	239.2	382.6	1024

During these 12 years, the volume of these native crops has varied greatly. The total value of agricultural exports in 1932 amounted to Gs. 384,882,000.

The estate areas planted and in bearing for the years 1928 to 1932 are given at respectively 1,139,319; 1,165,525; 1,223,329; 1,248,013 and 1,208,546 hectares (1 hectare = 2.47 acre). For the chief crops the 1932 areas (in hectares) and the production therefrom (not including produce purchased from native growers and exported mixed with the estate produce) are as follows:

	Area in hectares		Production
	planted	in bearing	
Rubber ...	582,196	396,747	150,898 metric tons
Sugar-cane ...	166,138	166,138	2,560,182 " "
Tea ...	135,704	120,734	68,601 " "
Coffee ...	127,145	109,382	62,714 " "
Oil palms ...	70,075	43,833	90,073 " " Oil 18,414 " " Kernels
Coconut palms ...	49,707	30,767	12,284,084 nuts
Tobacco for wrappers	44,487	44,487	33,815 metric tons

These figures do not include areas with mixed crops and the "smallholders" estates of only a few hectares each.

Cane Sugar.

An area of 6189 hectares was planted with pedigree-cane for planting material.

The estate area planted and harvested was 166,138 hectares, the native area 11,000 hectares.

The total crop of estate-grown cane was 22,369,440 metric tons. A total of 23,938 tons of native-grown cane was purchased by and milled in the factories.

The total factory-production of sugar was 2,560,182 metric tons. The crop from the native area is partly consumed in the raw state. About 77 per cent. is converted into native sugar for local consumption and export, chiefly to the

* Native exports.
† Total exports from Netherlands India less estate production.
§ Total of provincial export surplus.
‡ Purchased from native growers by estates.

Outer Provinces. The production of native sugar in 1932 was about 53,000 metric tons, of which 12,014 tons was exported from Java. The native population is increasingly using pedigree planting-material of high-yielding varieties.

Rubber.

The estate area planted is 582,196 hectares, of which 396,747 is in bearing. For the native-owned area, the figures are unknown. For the 5 years 1928-1932 the production has been in metric tons as follows:

Year	Estates	Native (dry)	Total
1928	140,928	91,353	232,281
1929	154,154	108,584	262,738
1930	153,530	90,496	244,026
1931	165,799	88,717	254,516
1932	150,901	61,447	212,348

Of the estate area, planted with rubber, 222,799 hectares are in Java, 341,459 hectares in Sumatra and 17,938 hectares in other islands. Unplanted estate reserve land is respectively 361,967; 561,908 and 65,681, totalling 989,556 hectares. Apart from this, large areas of state land would still be available outside Java.

Some rubber estates have fields with mixed crops, but of the total rubber bearing estate area, 82.9 per cent. only carries Hevea. For Java the figure is 70.2 per cent., for Sumatra 94 per cent., for the other islands 82.7 per cent. The mixed area is proportionately greatest in East Java, the secondary crop usually is coffee. In East Java there is a total of 78,591 hectares, carrying Hevea; of this area 30,736 hectares (= 39 per cent.) is unmixed and 47,855 hectares (= 61 per cent.) is the total of the Hevea-carrying parts of fields of mixed cultivation. Unmixed cultivation is, however, the rule in Sumatra and to a lesser extent also in West Java.

A table on page 84 specifies the estate areas in Java, Sumatra and other islands according to age, from which the following summary for the whole of the N.E.I. is drawn in hectares:

Year of Planting							Total	Tappable
1932	1931	1930	1929	1928	1927	Earlier		
6,912	18,182	31,650	28,520	47,356	43,781	405,795	582,196	396,747

The estate areas abandoned in Netherlands India are given below in hectares—

1927	1928	1929	1930	1931	1932
3,984	5,635	5,312	6,422	9,026	8,814

Estate rubber generally is taken into tapping in its seventh year of growth. To what extent the substitution of old fields by planting of high-yielding material has contributed to production, cannot yet be determined. This substitution has become an increasingly frequent practice during the past few years.

The tappable areas, not tapped in the course of the year, are given in absolute figures and in percentages of the total tappable area. For the whole of Netherlands India the averages were:

1st quarter	2nd quarter	3rd quarter	4th quarter	year
45,076	87,222	117,162	89,607	84,768 hectares
11.4	22	29.5	22.8	21.4 per cent.

Owing to the unevenness of cessation of tapping of part of the area in bearing it is impossible to give reliable figures of yield per area. Comparisons of the calculated figures for the periods January-June 1931 and 1932 showed an increase. This, however, may be due to the fact that the less productive fields were taken out of tapping first; that young fields in which tapping would otherwise have started remained untapped; also to a change of tapping system.

The exports of latex and concentrated latex; 90 per cent. of these exports came from the East Coast of Sumatra, which is particularly well situated for central handling of latex from the large number of adjacent estates. Exports of sprayed rubber were:

	1928	1929	1930	1931	1932
	kg.	kg.	kg.	kg.	kg.
Java	2,875,326	4,001,280	4,248,006	5,090,264	2,371,350
Sumatra	10,770,711	14,850,674	7,928,736	11,307,716	8,246,215

These amounts have been included in the export statistics quoted.

Native rubber is in Java produced in very small quantities. The area, however, is known; it is specified in a table of which the following is a summary.

	1931 planted area	1932 planted area		
		not tappable	tappable	Total
	hectares	hectares	hectares	hectares
West Java ...	5723	2795	2875	5670
Mid Java ...	308	295	55	350
East Java ...	1810	415	1809	2224
Total ...	7841	3505	4739	8244

Owing to the low rubber prices prevailing, these native fields are not tapped and are, as far as possible, being used again for planting food crops.

As a criterion of the extent of native rubber in the Outer Provinces, the export figures have had to serve primarily. A table on page 95 specifies the 1928 to 1932 exports from the various parts of Sumatra and Borneo. The following is a summary of this information in metric tons.

	Group			Total	Dry equivalent	Dry percentage
	1. dry	2. wet	3. wet			
1928	18,492	7,760	102,021	129,753	91,353	70.4
1929	24,111	6,970	114,071	145,527	108,584	74.6
1930	22,425	8,403	89,973	120,801	90,496	74.9
1931	22,940	5,473	89,719	118,132	88,717	75.1
1932	13,142	1,449	67,655	82,246	61,447	74.7

Another table gives the percentages of loss of weight on cleaning and milling of the various kinds of native rubber from Sumatra and Borneo. Native rubber can be classified in 3 main groups

Group 1: has passed through a mill, is clean and dry; loss of weight nil.

Group 2: raw, unpurified scrap and earth-rubber, wet and dirty; loss of weight in milling from 35 to 50 per cent.

Group 3: all other native rubber, moist and unclean; loss of weight in milling from 10 to 33 per cent.

Owing to the big decline of rubber prices, many native growers have stopped tapping and returned to the cultivation of foodcrops. The potential production, however, has further increased and is still increasing.

World Production of Rubber in tons of 2240 lbs.

	Production					Percentage of Grand Total				
	1928	1929	1930	1931	1932	1928	1929	1930	1931	1932
British Malaya ...	297,500	449,600	445,900	434,857	417,137	45.30	51.93	53.92	53.98	57.95
Netherlands Indies ...	228,832	258,733	240,210	250,511	209,019	34.83	29.88	29.04	31.09	29.04
Ceylon ...	56,000	80,500	75,500	61,500	49,500	8.53	9.30	9.13	7.63	6.88
British India ...	10,795	11,720	10,782	8,472	3,896	1.64	1.35	1.30	1.05	0.54
British North Borneo ...	6,799	7,381	7,115	6,247	5,379	1.04	0.85	0.86	0.78	0.75
Sarawak ...	10,750	11,313	10,310	10,451	6,960	1.64	1.31	1.25	1.30	0.97
Siam ...	2,700	2,900	3,900	2,963	2,231	0.41	0.34	0.47	0.37	0.31
French Indo-China ...	9,638	10,934	10,289	11,714	14,436	1.47	1.26	1.24	1.45	2.00
Other growers ...	4,300	5,100	2,100	3,037	2,769	0.56	0.59	0.26	0.38	0.38
Total of plantation rubber ...	627,134	838,181	806,106	789,752	711,327	95.51	96.81	97.47	98.03	98.82
Brazil ...	24,556	22,598	17,137	13,320	6,550	3.74	2.61	2.07	1.65	0.91
Other wild rubber ...	4,950	5,015	3,770	2,575	1,930	0.75	0.58	0.46	0.32	0.27
Total wild rubber ...	29,506	27,613	20,907	15,895	8,480	4.49	3.19	2.53	1.97	1.18
Grand Total ...	656,820	865,794	827,013	805,647	719,807			100		

The smaller percentage of dry rubber exported in 1932 is due to the fact that a number of small remilling factories have been closed.

The output of the small remilling factories in Sumatra and Borneo in 1928 to 1932 have been—in kilograms:

1928	1929	1930	1931	1932
12,716,865	20,343,060	18,510,749	20,837,794	11,383,675

to which the output of dry rubber, milled by the native growers, has to be added.

A table on page 99 gives the world production for the years 1928-1932, and the percentages contributed to these totals by the various producing countries.

Coffee.

The planted areas, so far as they are known, the estate-production figures and the export figures of native coffee from the Outer Provinces are as follows:—

	Planted Area—in hectares			Production—in metric tons		
	Estates	Native plantations		Estates	Native Coffee export from Outer Provinces	Total
		Java	Outer Provinces			
1928	126,762	unknown	unknown	55,314	70,635	125,949
1929	127,171	10,950	unknown	55,280	58,553	113,833
1930	130,337	15,818	unknown	40,313	54,236	94,549
1931	126,928	17,635	unknown	48,745	54,499	103,244
1932	127,145	20,578	unknown	62,715	69,958	132,673

71 per cent. of all estates are in Java; outside Java, Sumatra is the most important centre for coffee cultivation. Most estates also grow other crops, usually rubber.

The planted area is specified in a table, giving details for the year 1928-1932. For 1932 the percentage figures were:

	Planted with coffee	*With other crops*	*Reserve*
Java ...	26.1	26.5	47.4
Outer Provinces ...	17.3	13.3	69.4
Netherlands Indies ...	23.3	22	54.7

A table specifies the percentages of the production of 1928-1932, contributed by estate produce and by native produce. These averaged 37 per cent. from Java estates, 8.5 per cent. from Outer Provinces estates and 54 per cent. from native holdings in the Outer Provinces.

Nearly all the coffee estates in Java are in the eastern part. Of the total 1932 Java estate production of 51,439 tons, 46,426 tons came from East Java.

The bulk of the native coffee (mostly Robusta) is also in east Java.

Total planted area in 1932			Area in bearing in 1932		
Java	Robusta	Total	Java	Robusta	Total
2,382	18,196	20,578	1,404	11,553	12,957

In the Outer Possessions, the native growers mostly plant Robusta. From the following table, which is an extract of a fully detailed table of the exports of 1928-1932, it will be seen that about 97 per cent. of this native coffee comes from Sumatra (chiefly Palembang, Benkoelen and West Coast). The 1932 export was—in kilograms as follows :—

	Java	Liberia	Robusta	Other kinds	Unshelled	Total
Sumatra ...	1,834,786	—	64,563,746	—	4,037	66,402,569
Other Islands ...	3,015,036	5,076	534,781	—	160	3,555,053
Outer Provinces ...	4,849,822	5,076	65,098,527	—	4,197	69,957,622

The statistical figures of actual exports from Netherlands India to foreign countries do not quite tally with the known and/or calculated production figures owing to the great local consumption, accumulation of stocks and exports from old stocks.* The differences are shown in the following table.

	Known production in metric tons			Export in metric tons
	Estates	Native	Total	
1928	55,314	70,635	125,949	114,531
1929	55,280	58,553	113,833	81,814
1930	40,313	54,236	94,549	61,514
1931	48,745	54,499	103,244	68,581
1932	62,715	69,958	132,673	113,799

* Part of the native coffee, exported from the Outer Provinces to Java, is consumed there and part is stored there. From the table it is obvious that in 1932 a large part of the stocks, accumulated in previous years, must have been shipped.

In Java about 94 per cent. of the planted area is Robusta while in the Outer Provinces 90 per cent. is of this variety.

The Robusta yields per hectare in 1931 and 1932 were:—

		1931	1932
Java	...	560	740 kgs.
Outer Provinces	...	530	540 „
Netherlands India	...	550	690 „

Tea.

A table on page 123 gives summary figures for the planted areas and production in 1928-1932. It shows a gradual decline of native production of tea leaf for sale to estates and to curing factories.

	Planted area hectares		Production of dry tea. metric tons.				
	Estates	Native	Estate, including leaf, purchased from other than native growers		Native leaf, bought by estates and factories		Total
				per cent.		per cent.	
1928	115,237	34,844	57,254	78.6	15,608	21.4	72,862
1929	120,442	37,010	59,825	79.2	15,758	20.8	75,583
1930	126,996	41,202	57,628	80.0	14,363	20.0	71,991
1931	131,440	41,801	66,406	81.7	14,903	18.3	81,309
1932	135,704	39,375	69,513	84.8	12,424	15.2	81,937

Of a total of 325 estates with 135,704 hectares, planted with tea, 285 estates with 102,311 hectares are in Java—247 of which are in West Java—and 40 estates with 33,393 hectares are in Sumatra. There are 9 curing factories, purchasing and treating native-grown leaf; they are all in West Java.

On the tea estates in Netherlands India, 25.7 per cent. of the area is planted with tea, 14 per cent. with other crops and 60.3 per cent. is reserve land.

Of the 135,704 hectares, planted with tea, 120,734 hectares are in bearing, distributed over:

Java: West 84,984; Other parts 9,795.

Sumatra: East Coast 19,894; Other parts 6,061.

Total estate-area in bearing 120,734 hectares.

Information is given respecting the numbers and distribution of the estates, their areas of single or mixed planting, their production from own and from purchased native-grown leaf and on their gradual expansion. An extract is as follows: areas are in hectares.

	1928	1929	1930	1931	1932
Java ...	94,170	95,987	98,589	99,593	102,311
Sumatra ...	21,067	24,455	28,407	31,847	33,393
Netherlands India ...	115,237	120,442	126,996	131,440	135,704

This shows an increase of 8,141 hectares over the 1928 Java area in 5 years, equivalent to 8.9 per cent. and one of 12,326 hectares over the 1928 Sumatra area, equivalent to 58.5 per cent.

A table of world exports in tons is given, from which the following figures are drawn.

	1928	1929	1930	1931	1932
World ...	416,838	438,420	406,716	409,294	423,860
Netherlands India ...	69,658	72,450	72,019	78,742	78,763
Percentage ...	16.7	16.5	17.7	19.2	18.6

Tobacco.

This crop is grown and handled in various ways and the quality of the finished product differs greatly. The estates on the East Coast of Sumatra are in a class by themselves; they produce, nearly exclusively, the most expensive grade, used for cigar wrappers and they handle their own produce only.

In Mid-Java—Soerakarta and Jocjakarta—there is no native cultivation for sale of leaf to estates. All tobacco, grown for export, is grown and cured on estates.

In East Java—Besoeki—the so-called "estates" are, in fact, only curing factories. They hire the land from the native owners who are given the planting material and who grow the crop more or less in the native way under supervision, undertaking to sell the crop to the "estate" against payment on delivery. Locally this is called "estate tobacco", to distinguish it from the tobacco, grown by independent native growers, which is known as "freeman's tobacco" and in the report is classed as "purchased native-grown leaf".

Mid-Java and East Java methods of cultivation and economic arrangements are dissimilar. How much more intensive cultivation is in Mid-Java, is clear from the following figures.

1932	Soerakarta & Jocjakarta	Besoeki
estate-area ...	6,791	18,904 hectares.
production leaf-tobacco ...	11,068,846	8,333,146 kgs.

In the other tobacco-growing regions, the native growers cure their own crops and sell in the finished state to the middlemen in the trade. The figures

relating to this traffic are incomplete because the large number of Chinese and other small middlemen, who trade in the native produce, remain outside the range of statistical compilation. The native output can only be estimated and has been calculated to be in kilograms, as follows:

	Estate produce from		Total output of estates	Export	Native Tobacco
	controlled areas	native leaf purchased			
	1	2	3	4	4 less 1
1928	9,141,698	11,543,263	20,684,961	37,330,000	28,188,000
1929	9,342,790	7,860,062	17,202,852	48,802,000	39,460,000
1930	8,181,433	10,343,955	18,525,388	42,978,000	34,797,000
1931	9,818,049	12,611,143	22,429,192	45,526,000	35,708,000
1932	6,908,563	3,711,115	10,619,678	41,188,000	34,279,000

To the figures in the last column, local consumption would, of course, have to be added.

Cinchona.

The total area under this crop is 17,780 hectares. Of the 120 estates engaged in the cultivation of Cinchona, only 17 grow it as a sole crop.

The production in 1932 was—in metric tons—8,439 in Java and 1,681 in the Outer Provinces.

Oil Palms.

In 1932 there were 50 estates engaged in the cultivation of oil palms, 39 of which were in North Sumatra, and four in South Sumatra.

Areas and production are specified as follows:

Year	Estates	Planted area in hectares				Production in kgs.		Export in kgs.	
		Java	Outer Pro-vinces	Netherlands India		Kernels	Oil	Kernels	Palm Oil and Kernel Oil
				Total	In bearing				
1928	52	472	49,852	50,324	19,033	5,767,258	27,030,137	5,731,709	28,869,735
1929	48	665	57,046	57,711	23,473	7,065,514	35,970,706	6,836,562	35,876,819
1930	48	707	60,522	61,229	30,017	9,820,548	49,751,695	9,639,066	48,014,596
1931	51	705	67,725	68,430	36,322	12,805,305	64,457,238	12,200,201	61,387,360
1932	50	710	69,365	70,075	43,833	18,413,577	90,072,649	17,884,341	84,973,111

This crop is of very small importance in Java, where it is practically entirely confined to the vicinity of Buitenzorg. In Sumatra, however, especially on the East Coast, it has attracted considerable attention. During the year 1932 only 1,640 hectares were planted.

The area in bearing (hectares) is now distributed as follows:

Java	South Sumatra	North Sumatra	Other Islands	Total
144	2,108	41,526	145	43,833

Of the total area planted, 62 per cent. only is in bearing now and so a considerable increase of output may be expected in the near future. The crop promises to become one of the chief export crops of Netherlands India.

	South Sumatra		North Sumatra	
	Mature area in hectares	Total output in kgs.	Mature area in hectares	Total output in kgs.
1928	1,263	1,927,796	17,556	24,914,899
1929	1,318	2,652,828	21,928	33,139,201
1930	1,718	2,845,121	28,013	46,766,817
1931	2,018	3,344,202	34,018	60,948,533
1932	2,018	4,413,620	41,526	85,490,469

Coconut Palms.

This is predominantly a native crop.

Most of the estates are in the Outer Provinces and most estates do not interplant other crops.

The total estate area in 1932 was, in hectares:

Java	Sumatra	Celebes and Moluccas	Other Islands	Total
6,639	11,222	27,502	4,344	49,707

Of this total area 38,293 hectares, equalling 77 per cent. is unmixed cultivation and 30,767 hectares, equalling 62 per cent. of the total area, was in bearing; from this it may be concluded that estate cultivation is comparatively new.

The estate production of copra in 1932 was 27,312 metric tons, an increase of nearly 4,000 metric tons over that of the previous year.

In addition to this, the estates buy nuts and copra from the native growers. For 1932 this amounted to 2,050 metric tons of copra.

In 1931 the palms recovered from the severe droughts of 1929 and 1930
Native Cultivation. In 1931 the palms recovered from the severe droughts of 1929 and 1930 and in 1932 too the too the climate conditions were favourable and a plentiful crop was obtained.

The surplus, available for export from native cultivation, after satisfying domestic consumption, can only be calculated by deducting from the copra export figures the import figures and the estate export figures, all reduced to copra-equivalents. This in Java gives the following figures in metric tons:—

Java	1928	1929	1930	1931	1932
native produce ...	80,113	94,773	8,854	—	77,514

In 1930 the surplus was small; in 1931 imports exceeded exports; 1932 had a considerable surplus again.

Conversion to copra-equivalents has been fixed at 4300 nuts = 1 metric ton copra
1000 litres of oil (220 gallons) = 1.5057 metric ton copra.

The exact extent of native production in Java is unknown. A large part of the copra is consumed locally in the form of oil, milled in local mills; some of this oil is exported to the Outer Possessions and to foreign countries. The report gives two tables; one calculating the quantity of copra milled by these factories, from the known export of oil cake and its estimated local consumption as a cattle-fodder; this would put the quantities of copra, milled in the factories at about—

1928	1929	1930	1931	1932
204,000	207,300	174,600	160,200	174,300 metric tons.

The other table estimates local oil consumption by deducting oil exports from factory production; according to this table, the locally consumed percentage of the oil production of the oil mills in Java was:

1928	1929	1930	1931	1932
69.5	69.5	81.4	92.5	82.3

This would show a decrease of factory oil consumption against a large increase of copra exports. With low copra prices, domestic oil production for domestic consumption increases and the very adaptable small millers in the villages in 1932 increased in numbers. Any estimate of total native production still has to disregard the copra-equivalent of the oil, milled by these village mills, and of the nuts, used for culinary purposes. There also are no reliable data as to what part of the copra, imported into Java from the Outer Provinces, is re-exported and what part is milled for the production of oil.

The quantities of copra, used by the Java oil factories, have been added to the copra exports and from this total the copra imports from the Outer Provinces and the estate exports are deducted. This balance should approximately represent native copra output in Java.

1928	1929	1930	1931	1932
222,600	241,200	153,700	138,200	223,400 metric tons.

This shows a considerable increase of production in 1932.

Outer Provinces. The following figures are abstracted from a table which gives details of the surplus, available for export—to other parts of Netherlands India and to foreign countries—from the various islands and their component parts.

	1928	1929	1930	1931	1932
Total exports ...					428,954
Estate exports ...					22,232
Native exports ...	395,405	396,781	373,866	359,930	406,722

These figures disregard local consumption of nuts.

For the whole of Netherlands India, the estate contribution to copra exports is only 6 per cent. of the total; the situation is dominated by the quantity of native produce in excess of domestic demand.

The total exports of copra alone from Netherlands India have been :—

	Java			Outer Provinces			Total Netherlands India		
	Export	Estate output	per cent.	Export	Estate output	per cent.	Export	Estate output	per cent.
1928	47,534	3,534	7.4	393,317	19,805	5.0	440,851	23,339	5.3
1929	52,858	4,171	7.9	404,011	20,306	5.0	456,869	24,477	5.4
1930	7,358	3,466	47.1	368,359	21,939	6.0	375,717	25,405	6.8
1931	3,846	3,018	78.5	356,325	20,588	5.8	360,171	23,606	6.6
1932	62,714	3,941	6.3	417,236	23,371	5.6	479,950	27,312	5.7

Converting exports of oil and of nuts into copra-equivalents, the following figures are obtained in metric tons:

	Oil: equivalent	Nut: equivalent	Copra Exports	Total
1928	55,199	13	440,851	496,063
1929	51,860	66	456,869	508,795
1930	21,246	48	375,717	400,011
1931	7,314	432	360,171	367,917
1932	27,283	423	479,950	507,656

World Production. Local consumption in the countries of production being unknown, no reliable figures can be given. The surplus, available for export, can however, be estimated. The principal exporting countries are: the Philippines, Netherlands India, British Malaya, Ceylon and Oceania.

The exports from all countries, converted into copra-equivalents, for 1928-1931 and also some incomplete 1932 figures are given in some detail, of which the following table is an extract.

	1928	1929	1930	1931	1932
Philippines ...	504,127	527,170	452,454	476,838	?
Netherlands India ...	496,063	508,795	400,011	367,917	507,656
Ceylon ...	235,844	238,225	219,697	237,385	188,396
Malaya ...	114,666	130,355	121,043	120,299	120,053
Balance of Asia ...	27,595	30,938	25,915	21,888	?
Oceania ...	175,997	205,192	200,200	185,747	?
Africa ...	50,769	51,368	54,636	55,103	?
America ...	30,094	49,624	34,642	34,155	?
Total ...	1,635,155	1,741,667	1,508,598	1,499,332 metric tons	

Essential Oils.

The only cultivated crop of any importance is citronella grass. The total planted area is: in hectares

estates Java	estates Outer Provinces	native Java	Total
9,044	284	11,179	20,507

The estates buy leaf as well as oil from the native growers and distillers. The native output of oil is unknown, owing to the very large number of small distillers and to the distilling by a great number of small growers themselves.

The total exports of citronella oil in 1932 were 996,107 kilograms, as compared with 892,895 kgs. in 1931, and an average annual export for the past 5 years of 945,336 kgs.

Hard rope Fibres.

This is an estate cultivation only, chiefly of sisal, in Java as well as in the Outer Provinces. The total exports of the last 5 years have been:

1928	1929	1930	1931	1932
50,306	58,686	65,666	70,278	90,588 metric tons.

Kapok.

This is predominantly a native crop. The cleaning of the fibre from the pods is largely a village industry. In Java there are 129 estates, cleaning their own produce and native produce purchased, and further, 83 cleaning plants, working purchased native produce only.

About 90 per cent. of the fibre and 80 per cent. of the seeds exported are native produce. All kapok seed oil and oil cakes are native produce. The 1932 exports were:

Fibre	Seeds	Oil	Oil cake
19,093	16,972	2,167	11,999 metric tons.

Netherlands India supplies 90 per cent. of the demand of the world market.

Cocoa.

The 1932 exports were 1,551 tons, of which 102 tons were native produce. The area under cultivation is slowly but steadily increasing. The quality of the product is good.

Pepper.

The cultivation is almost entirely in the hands of Chinese and native growers in Sumatra and Borneo; Java's output is negligible. Part of the exports from these two islands to Java is re-exported and part consumed locally. In 1932 these exports were: in metric tons.

	Black	White	Total
Sumatra and adjacent islands ...	17,023	13,499	30,522
Borneo ...	3,205	2,432	5,637
Celebes ...	14	—	14
	20,242	15,931	36,173

The total available world supply was 209,403 metric tons for the 5 years 1928-1932, of which Netherlands India supplied 152,160 metric tons, equal to 72.5 per cent.

Tapioca.

This crop is practically confined to Java and is predominantly a native crop. A small part of the native crop is milled in factories; the bulk of it is consumed locally and a comparatively small surplus only is exported in various forms.

Exports Tapioca Products (Metric tons).

	1928	1929	1930	1931	1932
Dried tubers ...	55,949	20,386	11,022	19,244	40,285
Dried ground ...	274,547	99,645	28,621	52,270	81,235
Flour ...	126,921	116,758	75,057	100,576	87,960
Flakes and Siftings ...	10,339	6,933	4,820	5,114	5,255
Pearl and Seed ...	26,652	19,055	10,879	14,633	11,124
Fibre-residue ...	10,222	7,507	4,626	1,257	586

The native area planted and the crops of raw tubers in these same 5 years have been:

	1928	1929	1930	1931	1932
Area in 1000 hectares ...	739	710	650	696	717
Production in 1000 tons ...	6,161	5,129	5,911	5,216	6,222*

Coca.

This is exclusively an estate crop and is exported as leaf. The production has been, in kilograms:

1928	1929	1930	1931	1932
455,677	485,407	363,000	252,085	154,101

Netherlands India is one of the chief suppliers of the world market.

Gambier.

This crop is grown in the Outer Provinces only; one quarter of the total is produced on estates and three-quarters by native and Chinese growers on

* The raw crop of 1932 having been slightly larger even than the bumper crop of 1928, the fact that 1932 exports remained far below those of 1928 is interesting and shows that in times of adversity the native population of Java can partly adjust itself to the need for economy by greater proportionate consumption of the cheaper home-grown food.—*Translator.*

the East Coast of Sumatra, Rhio and Borneo. The exports, including those to Java for native consumption have been: in metric tons.

	Estate production	Native production	Total export
1928	4,178	9,955	14,133
1929	4,342	9,317	13,659
1930	4,481	9,082	13,563
1931	3,226	10,979	14,205
1932	3,272	9,451	12,723

Arecanuts.

This is entirely a native crop. The chief exporters are Atjeh, East Coast of Sumatra and Java. An extract from the table, shewing the exports from the various parts of Netherlands India is given below in metric tons:

	1928	1929	1930	1931	1932
Achin ...	23,337	21,548	18,708	18,447	17,130
East Coast of Sumatra ...	7,548	9,057	10,896	10,018	10,066
Java ...	6,727	8,677	7,580	6,383	8,422
Other producers ...	8,346	7,407	5,412	4,337	4,144
Total ...	35,958	46,689	42,596	39,185	39,762

Nutmegs.

This information is incomplete and local consumption is unknown, but supposed to be considerable; so that the export figures represent an unknown part of the total production. There are 15 estates in Java—mostly in Mid-Java—, 1 in Menado—North Celebes—and 10 in the Moluccas. In Java, the crop is mostly interplanted, whilst outside Java is generally a sole crop.

In Java the planted area is 1341 hectares, of which 789 hectares are in bearing. For the Outer Provinces, the figures are respectively 950 and 829 hectares. For the whole of Netherlands India this gives an area of 2291 hectares planted, of which 1618 hectares are in bearing.

In addition to the estates, there is a native cultivation, the area of which is unkown, but the output of which is known to be considerable and in Banda Island alone amounted to 818 tons of nuts and 80 tons of mace.

Cloves.

The chief centres of cultivation are Benkoelen in Sumatra and the Moluccas. The larger part of the exports from the Outer Provinces goes to Java to satisfy an astonishingly large consumption, mainly needed for the manufacture of the cheapest kind of native cigarettes.* How large this consumption is will be clear from the fact that, apart from the supplies received from the Outer Provinces, Java imports have been as follows:—

Year	1928	1929	1930	1931	1932
Metric tons	3,112	2,235	3,038	5,173	2,051

of cloves from foreign countries.

Exports from the Outer Provinces were:

	To			Total exports to Java, other Islands and foreign countries combined				
	Java	Other Islands	Foreign Countries					
	1932	1932	1932	1928	1929	1930	1931	1932
Moluccas ...	235	50	63	273	400	340	336	348
Other ...	158	36	31	1041	421	652	633	215
Total ...	393	86	94	1314	821	992	969	573

Rice.

Only a very small part of the crop is exported. The Java crop, averaging 3,600,000 tons of husked rice, is not quite sufficient to satisfy local consumption and the Java imports in 1931 and 1932 amounted to respectively 231,702 and 275,684 metric tons.

The planted areas and the production of Java have been as follows:

	1928	1929	1930	1931	1932
Area in 1000 hectares ...	3,526	3,423	3,559	3,513	3,690
Production in 1000 metric tons ...	3,483.3	3,380.6	3,652.8	3,507.3	3,713.9

* They are made from a pinch of heavily sauced and doped coarse native tobacco, wrapped in a screw of the dried leaf of which the stem of the nipah palm is composed. There is not a ranker smoke in the whole wide world!—*Translator.*

In the above figures, husked rice is taken to be half the quantity of padi "in the ear". 88 per cent. of the planted area was wet rice land and 12 per cent. dry rice land: 93 per cent. of the crop came from the former and 7 per cent. from the latter. In 1932, the bulk of the harvest was reaped in May and June.

The import requirements of Java are, to some extent, satisfied by the export surplus of the Outer Provinces, chiefly Bali and Lombok. Celebes, which has a large export surplus, exports chiefly to other islands. These other islands, especially the East Coast of Sumatra, have to import large quantities from foreign countries.

The export of rice to foreign countries has been in metric tons:

	1928	1929	1930	1931	1932
Java ...	7,649	9,312	5,241	10,413	3,214
Outer Provinces ...	1,475	1,008	765	3,996	3,704
N.E.I. ...	9,124	10,320	6,006	14,379	6,918

Maize.

This is exclusively a native crop for domestic consumption. Three-quarters of the Java crop is grown on dry land and only one-quarter on the wet rice lands.

The Java figures for planted areas, production and export have been:—

	1928	1929	1930	1931	1932
Area in 1000 hectares ...	1,886	1,727	2,025	1,962	2,002
Production in tons of grain ...	1,943,100	1,576,400	2,002,900	1,910,800	1,902,300
Export in tons of grain ...	162,782	104,695	78,807	110,999	106,304

The figures for export (metric tons) from the Outer Provinces were:
54,844 69,195 43,518 57,291 67,186

Sago.

The figures for export to foreign countries were in metric tons:

	1928	1929	1930	1931	1932
East Coast of Sumatra ...	19,952	26,975	33,697	33,917	40,084
Rhio and Dependencies ...	11,233	12,157	9,629	8,845	10,115
West Borneo ...	1,707	2,783	8,061	2,757	3,074
Celebes etc. ...	140	143	160	180	34
Total ...	33,032	42,058	51,547	45,699	53,207

Export comes from the Western part of the Archipelago only, where sago is not the chief food supply as it is in the eastern part, notably the Moluccas.

Potatoes.

Planted areas and exports were as follows:

	1928	1929	1930	1931	1932
Java area in hectares ...	20,998	19,604	17,460	17,709	23,968
Java exports—metric tons ...	3,029	2,116	1,486	1,195	2,068
Outer Provinces exports— „	4,838	5,668	4,835	2,517	2,886
Total exports ...	7,867	7,784	6,321	3,712	4,954

Chillies.

In the Outer Provinces, this crop for export is of no importance. In Java, it is of some importance and the crop is chiefly planted on dry rice land; 72 per cent. against 28 per cent. on wet rice fields. From the latter, the crop is harvested in December, from the former in August.

Cotton.

Exports to foreign countries were in metric tons:

	1928	1929	1930	1931	1932
Java ...	647	543	558	974	485
Outer Provinces ...	938	1,036	820	706	746
Netherlands India ...	1,585	1,579	1,378	1,680	1,231

Practically the entire Java export is cleaned of seeds, and practically the entire export from the Outer Provinces is uncleaned.

L. A. J. R.

Conversion Table.

1 hectare = 2.471 acres. 1 kilogram = 2.2026 lbs.
1 metric ton = 1000 kilograms. 1 Eng. lb. = 0.454 kilogram.
1 English ton = 2240 lbs. = 1016 kilograms.
Yield: 1000 kgs. per hectare = 891½ lbs. per acre.

Miscellaneous Articles.

CONDITIONS ON SMALL RUBBER HOLDINGS IN MALAYA.

4th Quarter 1933

Prepared by the Economics Branch of the Department of Agriculture, S.S. and F.M.S. in collaboration with the Field Branch of the Department of Agriculture.

Rainfall.

In Perak the total rainfall for the quarter was very slightly below average, but the monthly totals showed variation from the average. October's precipitation was appreciably below the average whilst it was slightly above average for both November and December. In October the rainfall was fairly evenly distributed throughout the month, but the distribution was irregular in both November and December. The rainfall in Selangor was below the average in all districts during October and November, especially in the coastal districts, whilst in the inland districts during December, rainfall was slightly above average. Wet weather prevailed throughout the quarter in Province Wellesley, Penang and Dindings, the heaviest rainfall occurring in October when 35.83 inches were recorded in Penang.

On the east side of the Peninsula, the north-east monsoon had not broken at the end of November, although its influence was felt in the north-western area.

Prices.

Table I included in this article, shows the range of prices for the 4th quarter 1933, the Singapore average price for small-holders' rubber having remained fairly steady since August. The peak price for the year was secured in July when Singapore Standard Sheet sold for 14 11/16 cents per lb. and the small-holders' rubber averaged $17.50 per picul.

There was a decrease in price for all grades during August, September and October but the price firmed during November and December.

The quotations in the Table show the ruling prices from a large number of buying centres and it should be noted that such factors as transport and local competition affect the prices secured by the small-holder for his rubber.

The following Table shows the trend of average prices ruling in Singapore per picul at the end of each month for Kampong rubber during the year 1933.

Table I.

Rubber Prices [in Straits dollars per picul (133⅓ lbs.)]

4th Quarter, 1933.

	Singapore standard sheet Average	Singapore for small holder's rubber at end of month	Penang for small holder's rubber	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Province Wellesley	Kedah	Johore
OCTOBER											
Smoked sheet.	17.25	15.50	—	10.50-15.90	13.00-16.50	12.80-15.75	10.50-17.00	13.00-16.00	13.50-16.00	12.50-15.50	10.00-16.20
Unsmoked sheet.		14.50	12.60-14.40	9.00-13.50	12.-0015.50	10.00-13 50	9.00-15.00	10.00-15.00	12.80-15.00	10.50-12.80	7.50-14.25
Scrap		5.00	5.20-6.50	1.00-5.50	3.00-6.00	2.00-5.50	—	3.00-6.00	4.-006.50	3.50-7.00	1.80-6.00
NOVEMBER											
Smoked sheet	17.51	16.50	—	11.50-15.80	14.00-17.00	12.00-16.50	12.00-16.00	13.00-16.00	13.00-18.00	13.00-15.20	10.00-16.20
Unsmoked sheet		15.00	12.00-14.20	10.00-14.30	12 00-14.50	10.00-14.00	10.50-14.80	11.00-14.50	11.00-17.00	10.00-13.50	7.50-14.50
Scrap		5.00	5.50-6.50	1.80-6.20	3.00-6.50	2.00-6.00	—	3.50-7.00	2.85-6.50	3.50-6.50	1.80-7.10
DECEMBER											
Smoked sheet.	18.08	16.50	—	13.00-17.00	14.00-17.95	13.00-17.00	12.00-17.00	14.00-17.00	12.00-16.50	12.50-16.50	12.00-17.00
Unsmoked sheet.		15.50	13.50-14.60	10.50-14.25	12.0014.50	10.00-15.00	10.00-15.00	12.00-16.50	10.00-15.00	10.00-13.60	8.00-15.60
Scrap		5.50	5.00-6.20	2.75-6.00	3.00-6.00	2.50-5.00	—	3.50-8.00	3.00-6.00	4.00-6.50	1.50-6.50

Table II.

Average Singapore Prices for Rubber 1933.

	Smoked Sheet $	Unsmoked Sheet $	Scrap $
January ...	8.00	7.00	3.20
February ...	7.50	6.70	2.40
March ...	7.60	6.80	2.50
April ...	7.80	6.80	2.70
May ...	11.80	11.00	5.00
June ...	13.50	12.25	5.00
July ...	17.50	16.00	7.00
August ...	15.00	14.00	6.00
September ...	15.00	14.00	5.50
October ...	15.50	14.50	5.00
November ...	16.50	15.00	5.00
December ...	16.50	15.50	5.50

Tapping.

Reports from Penang state that, as compared with last quarter, tapping is on the increase, some holdings having started tapping twice daily, i.e. morning and evening and that there is a small increase in the total number of holdings, due to young holdings in the Dindings being newly brought into tapping; similar reports of young rubber being brought into tapping have been received from Pahang.

In the Krian and Selama districts of Perak, much of the tapping on small-holdings was done on the half-share system, tapping being usually on two or more panels.

Tapping in Malacca continued to be heavy owing to the prevailing good prices for rubber and the increase in the number of tapped holdings continued.

Areas out of Tapping on Small Holdings.

The method of estimating the area untapped among small-holdings by means of counting the number of such holdings along the sides of main roads was again employed, the result of this computation is shewn in Table III and was applied to the known area of tappable rubber, 1927 planting and earlier.

The total area of tappable rubber on estates of less than 100 acres which was untapped in the Federated Malay States in December 1933 is estimated on the foregoing system as amounting to approximately 45,000 acres as compared with 49,000 acres in September, 56,000 acres in June and 133,000 acres in March of this year.

The total area untapped in the Straits Settlements in December is estimated to be 14,000 acres as compared with 17,500 acres in September, 28,000 acres in June and 49,000 in March of this year.

Diseases.

Mouldy Rot.—In Penang and Province Wellesley North, mouldy-rot was prevalent towards the end of November and it was suggested that this outbreak might be connected in some way with movements of labour due to the present high prices of rubber.

The disease continued to be prevalent in all of the four western districts of Pahang, whilst no improvement was recorded in the position regarding the control of mouldy-rot in Perak, the response to efforts made to sell disinfectants being still very small. In Selangor there was a slight increase of mouldy rot infection during the quarter as a result of wet weather conditions and it was stated that control treatment was fairly well carried out, whilst in the Negri Sembilan the rainy season was responsible for a widespread distribution of the disease.

Pink Disease.—Some cases of this disease occurred in Province Wellesley and control measures were at once taken.

Root Disease.—It was reported that root diseases were fairly widely distributed throughout small holdings in Pahang, but that they did not result in any material damage.

Oidium Leaf Disease.—No reports were received in regard to this disease.

Grades of Rubber Made.

Figures of the percentages of the various grades of rubber produced, where these have been recorded, are as follows :—

PERAK : *Kuala Kangsar* :—(figures from 6 dealers) smoked sheet 32, unsmoked sheet 42, scrap 26.

Larut and Matang :—Smoked sheet 6, unsmoked sheet 70, scrap 23 and Lump 1.

Selama :—smoked sheet 80, unsmoked sheet 15, slab rubber and scrap 5.

PENANG and PROVINCE WELLESLEY : (figures from 26 dealers) smoked sheet 16, unsmoked sheet 70, scrap 14.

SELANGOR : *Kuala Langat* : smoked sheet 75, scrap 25.

Klang : smoked sheet 70, scrap 30.

Kuala Langat : smoked sheet 71, scrap 29.

Ulu Langat : smoked sheet 79, unsmoked sheet 8, scrap 13.

Ulu Selangor : smoked sheet 89, scrap 11.

MALACCA : *Central* : smoked sheet 29, unsmoked sheet 51, scrap 20.

Alor Gajah : unsmoked sheet 81, scrap 19.

Jasin : smoked sheet 21, unsmoked sheet 62, scrap 17.

Table III.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres, at the end of December, 1933.

PERAK

District	Total Tappable area	Total area untapped	Percentage
Batang Padang	37,288	1,000	3
Kinta	34,180	2,000	6
Kuala Kangsar	43,485	1,000	2
Upper Perak	13,774	1,500	11
Larut & Selama	51,407	5,000	10
Krian	9,751	2,000	21
Lower Perak	47,937	1,000*	2*
	237.822	13,500	6

SELANGOR

District	Total Tappable area	Total area untapped	Percentage
Klang	18,879	4,000	21
Kuala Langat	29,263	2,000	7
Ulu Langat	38,867	6,000	15
Ulu Selangor	30,632	1,000	3
Kuala Lumpur	21,174		
Kuala Selangor	9,379	3,500†	11†
	148,194	16,500	11

NEGRI SEMBILAN

District	Total Tappable area	Total area untapped	Percentage
Seremban	19,241	2,000	10
Tampin	17,947	2,000	11
Kuala Pilah	17,470	3,000	17
Jelebu	6,270	250	4
Port Dickson	10,653	1,000	9
	71,581	8,250	12

PAHANG

District	Total Tappable area	Total area untapped	Percentage
Raub	7,361	1,500	20
Kuala Lipis	15,951	1,000	6
Bentong	13.600	1,500	11
Other Districts	31,223	3,000	10
	68,135	7,000	10

MALACCA

District	Total Tappable area	Total area untapped	Percentage
Central	17,687	2,000	11
Alor Gajah	31,387	8,000	25
Jasin	24,971	250	1
	74,045	10,250	14

PENANG & P. WELLESLEY

District	Total Tappable area	Total area untapped	Percentage
North	3,241	100	3
Central	7,067	200	3
South	8,149	—	
Dindings	7,279	1,000	14
Penang	11,114	500	4
	36,850	1,800	5

SINGAPORE

District	Total Tappable area	Total area untapped	Percentage
Singapore	12,781	2,000	15
	12,781	2,000	15

The percentage of areas out of tapping in September, 1933, was as follows:—Perak 8, Selangor 8, the Negri Sembilan 16, Pahang 12, Malacca 15, Penang and Province Wellesley 9, Singapore 24.

* Estimated from same percentage as shown in Kuala Kangsar District.

† Estimated from mean percentage for remainder of State.

THE MALAYAN PINEAPPLE TRADE IN CANADA.*

Growth of Malayan Trade.

The Malayan canned pineapple trade in Canada has increased by 35.5 per cent. during the past five years, in 1932, 81.3 per cent. of the total imports of canned pineapples in that country being from the Straits Settlements. This increase has been mainly at the expense of the United States of America and Hawaii, whose combined imports into Canada have during the same period, decreased by 36.8 per cent. This situation is partly the outcome of the Ottawa Conference, whereby Empire produce is subject to an import duty of one cent (gold) per lb., as against five cents per lb. levied on the product from non-Empire countries.

On the other hand, the exports of pineapples from Malaya to Canada during 1932 amounted to only 85,000 cases, as compared with 219,000 cases in 1931, so that the reduced import evidently lay in the offtake of canned pineapples in general. The total imports of canned pineapples into Canada from all sources was 16,677,579 lbs. in 1932, 24,159,734 lbs. in 1931, 20,520,478 lbs. in 1930, 19,674,205 lbs. in 1929 and 15,054,834 lbs. in 1928.

Provisional figures for the first few months of 1933 seem to indicate a very considerable increase in imports, as well as a further developments in Malaya's relative share.

Position of Malayan Pineapples.

The Publicity Officer from the Malayan Information Agency took occasion to visit a large number of chain stores in Toronto, Ottawa and Montreal, and in each of these cities he found a different state of affairs. The one common feature was the absence of American and Hawaiian pineapples, which seem to have been virtually driven off the market.

In Toronto, the demand for canned pineapples seemed to be concentrated very largely on the "luxury" grades and, although there was a good demand for the Malayan product at about 11 cents (gold) per tin, there was an even better demand for Queensland pineapples at from 15 to 20 cents a tin. The possible explanation is that the poorer classes of Ontario have not yet learned to look upon pineapples as an article within their means.

In Ottawa, the public demand was divided between "luxury" and "cheap" with the preponderance, if any, in favour of the latter. Malayan pineapple was reported to enjoy a steady demand.

In Montreal, however, Malayan pineapples seemed to all intents and purposes to have a monopoly. Little or nothing else was to be seen in the shop windows, and the store-keepers asserted that the "luxury" trade was practically non-existent.

* Abridged from the Report on the participation of Malaya at the Canadian National Exhibition, Toronto 1933, by the Publicity Officer of the Malayan Information Agency, London.

Relative Prices.

Special Sliced Malayan pineapple in 1½ lb. "talls" is shipped to Canada at present at an approximate price (c.i.f.) of 2s. 10½d. per dozen tins labelled, for minimum carloads of 500 cases and this is a considerably lower rate than that at which the product of any other country can be put on the market.

To arrive at an average retail price, however, is extremely difficult; in one store they were marked at two cans for 25 cents, in another at 10 cents a can and in a third it was 9 cents a can or three for 25 cents. The explanation was that the store first cited was temporarily short of pineapple stock and wanted to "mark time" with sales, while the third store was making a special "feature" of cheap pineapples in order to attract customers.

Graded Pineapple.

This commodity was brought to the attention of various distributors' representatives and also to a large number of retailers and store-keepers. All those who saw the graded pineapple were very impressed by its even colour and good appearance generally. None the less, they were unanimous in declaring that there is no place for it on the Canadian market if the certificate of grading involves any increase in price.

Crushed Pineapple.

The market for this commodity does not appear to have been explored nearly so fully as it deserves, and the demand is now likely to increase as the result of the Malayan participation at this Exhibition.

Several store-keepers stated that they had been approached for Malayan crushed pineapple but had been unable to supply it—had hitherto been unaware, in fact, of its existence. This is a matter which no doubt will soon be adjusted.

One distributor was of opinion that the rather higher cost of crushed pineapple will be likely to operate against its wide popularisation, though this might not be an insuperable obstacle if the public became genuinely interested. He was also of opinion that it would be necessary to have an absolutely distinctive label; also that the word "grated" must be eliminated and the grade simply termed as "crushed", which is the term used in the case of the Hawaiian and Australian products.

Pineapples in Cubes.

This commodity is practically unobtainable from Canadian stores, but there would appear to be a not inconsiderable potential demand. The opinion has been expressed in one quarter that the demand for cubes will never be strong enough to overcome the handicap of the higher price for this packing.

Pie-Fillings.

The Malayan representative at the Canadian National Exhibition was approached by a firm who for some time past has done a considerable business in the importation of frozen fruits for pie-fillings.

It appears that the firm applies to this business a special patent process. The peculiar value of this process, it is claimed, lies in the fact that the frozen fruit will remain good for a lengthy period after being removed from cold storage.

The firm is anxious to add crushed pineapple to the list of pie-fillings which it imports, but has been prevented hitherto by the high price of Hawaiian fruit. Ordinary canned crushed pineapple is unsuitable; it has too high a liquid content. It is thought, however, that a good volume of business could be developed by the application of the process to crushed pineapple in Malaya, and the firm in question would be willing to explain it to a reliable firm if satisfactory arrangements could be made.

Conclusion.

The conclusion would seem to be that there will definitely be room for expansion of the market in Canada for low-priced foodstuffs such as Malayan canned pineapple; while to this it should be added that the Malayan fruit, provided it continues its present improvement in respect of quality, flavour and grading, ought to be able also to secure at least some share of the "luxury" trade.

INTERNATIONAL GROCERS' EXHIBITION, 1933.*

The Exhibition was held at the Royal Agricultural Hall, Islington from September 16th to 23rd.

Once again, a comprehensive display of Malayan canned pineapples was rendered possible by the co-operation of various importing firms who provided free samples of this product. In addition to pineapples, exceptionally good samples of tapioca were on view and attracted favourable notice.

This being purely a trade show, propaganda was aimed primarily at the retail grocer, as opposed to the consumer. With Malaya already providing almost 94 per cent. of the canned pineapple annually imported in to the United Kingdom, it is self-evident that little scope remains for the expansion of Malaya's proportionate share of the market. It is a recognised principle of advertising, however, that a commodity must continue to be kept before the public attention

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* Abstract from a report by H. S. Banner, Publicity Officer, Malayan Information Agency, London.

however firmly it may seem to be established. Moreover, such exhibitions as this provide an opportunity for demonstrating that Malayan pineapple is making steady advancement in regard to quality, flavour and grading.

The quality of pineapple supplied for this Exhibition was the best sample of the product handled during the writer's experience extending over the past six years. Such improvement must be maintained if we are to keep the enviable place on the market which we have won.

As the position is at present, the retailer has learned that it definitely pays to stock Malayan pineapples. One buyer who visited the stand—a man who deals in 2,000 case lots—stated that he had first commenced to stock the Malayan product, in place of that of a competing country, after its introduction to his notice at this same exhibition two years ago. His trade has increased by 100 per cent. since he took this step.

The volume of new business brought about through the agency of the Malayan Stand naturally grows less each successive year—"naturally", because of Malaya's almost monopolistic position on the market at the present time. Nevertheless, a fair number of new connections for medium-sized lots were effected.

Reviews.

Malayan Agricultural Statistics, 1932.

By D. H. Grist. Special Bulletin, Department of Agriculture, S.S. and F.M.S., Economic Series No. 3. 74 tables, 2 graphs. 1933. Price 50 cents.

This Bulletin contains statistical data concerning Malayan agriculture and brings up to-date, the information published in Bulletin No. 1 of the Economic Series of this Department respecting the year 1931.

It is compiled by the Economic Branch and in the course of its preparation, use has been made of data compiled by other Departments of Government, notably the Customs, Statistics and Veterinary Departments, and the Meteorological Branch of the Survey Department.

The present edition is considerably larger than the previous edition. It contains 11 additional tables, while a number of footnotes have been added which further explain the figures and give information respecting the more important countries of import and export.

The bulletin attempts to present a statistical review, over a number of years, of Malayan agricultural industries and trade. It not only shews the developments that have taken place, but demonstrates the local market which exists for products suitable for cultivation in Malaya, but of which large quantities are imported.

In addition, statistical information is given of areas and distribution of crops in Malaya, yields and market prices.

The M.A.H.A. Magazine.

The M.A.H.A. Magazine, published monthly, is the official organ of the Malayan Agri-Horticultural Association and the Selangor Gardening Society. The January number (Vol. IV, No. 1) contains a number of articles of interest to those to whom gardening is a hobby and also to a wider public who are engaged in various aspects of agriculture. The original articles included in this number are on Hedges; Insect Pests of Ornamental Plants; New or Interesting Ornamental Plants; The Control of Rural Malaria; Rainfall Recording; and Milk Production in the Tropics and the Value of Pasteurisation.

The Magazine costs 36 cents post free, or $1.20 per annum and is good value for the money. Subscriptions should be addressed to the Editor, M.A.H.A., 12 Barrack Road, Kuala Lumpur.

Departmental.

FROM THE DISTRICTS.

The Weather.

The month was characterised by an unusual period of wet weather, giving a rainfall much above the average in all parts of the Peninsula except in the States of Kedah and Kelantan and a few other localities including Cameron Highlands. The wet period occurred generally during the first fifteen days to three weeks of the month; but in Krian and Larut Districts of Perak and on Cameron Highlands the middle ten days constituted the wet period. While Krian and Larut Districts experienced a heavy rainfall, minor floods occurred in Pahang and more severe floods in Johore and Singapore Island. Strong North-East Monsoon winds were prevalent.

Remarks on Crops.

Rubber.—The average price of rubber rose as a result of the increasing possibility that a restriction scheme would, before long, materialise. The highest and lowest prices in dollars and cents per picul recorded during the month for rubber from small holdings were:—Smoked Sheet $12.50 to $19.50; Unsmoked Sheet $10 to $18; Scrap $1.50 to $7.25. The average Singapore prices for these grades were respectively $19, $17.50 and $6 as compared with $16.50. $15.50 and $5.50 in December. Penang prices for Unsmoked Sheet ranged from $13.50 to $16.50 as compared with $13.30 to $14.60 in December.

Two opposing tendencies were manifest during the month. On the one hand, the increase in the price of rubber and the need of ready money for the expenses of the Mohamedan New Year festivities tended to increase production, through further additions to the number of properties in tapping and by the wider use of somewhat severe tapping methods. On the other hand, wet weather, padi harvest, and the incidence of part of the fasting month with the following new year celebrations, tended to reduce production by restricting tapping, while the commencement of wintering and high winds in the dry weather at the close of the month reduced the yield of rubber from the trees tapped.

In Kelantan, the movement towards improving the quality of the rubber produced on small holdings is extending.

Padi.—The price of padi at the Government Rice Mill, Bagan Serai, was fixed at $1.50 per picul, a fall of 12 cents per picul as compared with that of December. This reduction is in sympathy with the prevailing low price in the world's markets. The price at this mill was, however, better than that offered by private millers in Kedah, where it varied from $1.10 to $1.15, or in Penang Settlement, where it was $1.25 per picul. In other parts of the country, the price has ranged from 5 to 15 cents per gantang in the villages, the most usual prices being 5 to 9 cents.

Harvest was in full progress in Kedah, Penang and Province Wellesley, Krian and Malacca where yields so far obtained have been good. Except in

Kedah, high winds and rain caused rather extensive lodging; on the whole, however, yields did not suffer, though in Malacca the quality of some of the grain was affected by the wet weather.

In the later planted areas in Larut, Kuala Kangsar and Upper Perak Districts of Perak the rain improved the crop, but in the Kuala Pilah District of Negri Sembilan floods did some damage.

In Kelantan, a good crop of dry padi was harvested, but the wet padi crop is likely to be poor.

Coconuts and Copra.—The price of copra remained very low at $2.20 to $2.40 in Penang and $1 to $3 per picul elsewhere.

While Malays continued to show interest in the preparation of improved copra, more especially in Province Wellesley, Krian and Johore, there was little definite progress to record during the month.

Pineapples.—Comparatively little canning was done in Johore and Singapore during the month owing to the scarcity and consequent high price of fresh fruits which sold at prices up to $3 per 100 fruits of first quality. This is a high figure in proportion to the present low price obtainable for the canned product.

The reduction in supply is mainly attributed to reduction of the area planted as a catch crop without a compensating increase in the area planted as a sole crop. It is considered, however, that a reduced yield from areas of older plants grown without manuring and also, possibly, the climate during the present season are contributing causes.

Fruit.—Fairly heavy crops of the main tree fruits were obtained in the Bentong District of Pahang, but only small crops in Kuala Lipis District. In the Negri Sembilan and Singapore Island, the season was drawing to a close. In Kedah, large supplies of water melon were on sale in the local markets.

Tobacco.—Prices for sundried tobacco leaves have ranged from $14 to $40 for first quality and $8 to $20 per picul for second quality in most areas. In parts of Johore the price for first quality leaf was as high as $65 per picul, while in Province Wellesley the top price was only $22 per picul. There was a tendency to reduce the planted area in Province Wellesley, Malacca and Selangor. In the Province, food crops are being substituted for tobacco, while in Malacca, Chinese padi and vegetable growers are using chillies in preference to tobacco as an inter-season crop.

Further flue curing trials at the Pineapple Experiment Station in Singapore during the month resulted in the production of a leaf of good colour, but of poor quality. The leaves were mainly obtained from untopped plants grown for seed and were, in consequence, small and thin, though comparatively easy to cure effectively. After harvesting the leaves yellowed naturally in one to one and a half days and the fixing and drying processes occupied only a further two days. The proportion of yellow leaf obtained was very satisfactory.

Arecanuts.—While in most parts of the Peninsula the price of dried arecanuts remained very low, it was somewhat better in Malacca, where a revival of interest and a fairly brisk trade in nuts was reported.

In interesting minor industry exists in the Muar District of Johore. Chinese from Kelantan and Trengganu visit this District in the cropping season and prepare salted arecanuts for export to Hong Kong and Shanghai and thence to the interior of China. The Chinese buy the ripe fruit and pack it with salt into large baskets holding about 1½ piculs. The fruits are well rammed down and the baskets are then shipped to Singapore for export to China. At the end of the season, the Chinese return to the North East coast where the arecanuts ripen later than in Johore.

Vegetables.—Preparation of the land for the cultivation of vegetables was proceeding in many parts of Kelantan. As a new development, some plots of vegetables will be planted in the padi fields of Pasir Puteh District after the padi harvest. In Singapore Island, considerable damage was done by floods to many of the vegetable-growing areas during the first half of the month; in some localities practically a total loss of the growing vegetables was recorded.

Agricultural Stations.

The various experiments with tea at the Government Experiment Station, Tanah Rata, have not been in progress long enough to give reliable results, but it may be mentioned that the first records from manurial experiments with various fertilisers indicate that an adequate supply of nitrogen is the most important factor in maintaining the vigour and yield of the bushes. The analysis of the first year's records from an experiment on pruning intervals for mature tea indicates an interval of at least 3½ years between prunings may be allowed and that manuring is advantageous when tea is kept in bearing for this period.

A second break of 68 half chests of tea was ready for despatch to England early in February.

The fowls recently imported from England for this Station have given a large number of eggs, varying according to breed from an average of 19 to 23 per pullet for the month. Of these eggs, 52 per cent. were over 2 ozs. each and 48 per cent. between 1½ and 2 ozs.

At the Central Experiment Station in Kelantan, the plots of the manurial experiment with dry padi were harvested. In spite of difficulties resulting from wet weather and damage from rats sheltering under the lodged crop, good yields, averaging over 340 gantangs per acre, were obtained.

Padi Test Plots.

Harvesting of manurial and other experiments was completed at the Padi Test Plots at Langgar, Jitra and Rantau Panjang in Kedah. At the first two Plots there were some excellent plot yields. Stores of the local type (Malay: kepok) were erected for padi seed for distribution at Langgar and Jitra at small

cost. Harvest was also in progress at the Kuala Kurau Padi Test Plot in Krian, where lodging had resulted from the strong winds and rains experienced about the middle of the month. Notwithstanding this, crops were good, those reaped averaging about 600 gantangs per acre.

Harvest was also completed at the Tangkak, Labis and Segamat Padi Test Plots in Johore. At the first two Plots the pure strains of padi ripened before the local varieties both on the Plots and in the surrounding padi fields. Consequently they suffered severely from the attacks of birds. The local varieties gave yields of about 500 gantangs per acre as compared with 200 to 240 gantangs per acre from the damaged pure strains. At the Segamat Plot, Siam 29 and Siam 76 yielded at the rate of 300 gantangs per acre as compared with 210 and 180 gantangs per acre respectively from the local Serendah Kuning and Serendah Puteh.

Rural Lecture Caravan.

The Caravan visited four centres in Ulu Selangor District during the month, staying two days at each. Lectures illustrated by models and lantern slides were given on housing and care of poultry. Large audiences attended and showed much interest in the lectures.

NOTE.

Manuring of Sugar Cane in British Guiana.

In the introduction to Part I of the series of articles on studies of Malayan soils which appeared in the August 1933 number of this Journal, a statement was made concerning sugar cane soils in Demerara.

In a recent letter to the Director of Agriculture, S.S. and F.M.S., Professor J. Sydney Dash, Director of Agriculture. British Giuana writes as follows :—

> " I do not think British Guiana is ever likely to use pen manure and her yields have steadily increased during the last three years by nearly a ton of sugar per acre due to increased tillage, increased use of flood fallowing and increased use of commercial fertilisers ".

It may be pointed out that in the article in question there was no intention of suggesting that British Guiana was likely to be in a position to use pen manure. the situation in that country presumably being, in certain respects, parallel with Malaya where it may be regarded as practically certain that the extensive use of pen manure is, from the nature of conditions, hardly likely ever to become generalised.

The effect of flood fallowing as practised in Demerara as part of procedure for restoring soil fertility seems to be a point of particular interest.

H. A. T.

DEPARTMENTAL NOTES.

Visits and Tours.

On January 19th and 20th the Director of Agriculture visited the Negri Sembilan and Malacca where he inspected the Agricultural Stations and discussed various questions with the Agricultural Officers. He also conferred with the Resident Councillor, Malacca.

From January 20th to 29th the Director of Agriculture paid an official visit to Johore, at the request of the Government of the State, for the purpose of inspecting the agricultural services and of reporting to the Johore Government on measures to be adopted for their extension. During the period the Director conferred with the General Adviser and with Assistant Advisers and Agricultural Officers and visited all districts throughout the State.

On January 22nd the Director of Agriculture attended a meeting of the Executive Council in Singapore for the purpose of discussing questions relating to the rice industry in the Straits Settlements with His Excellency the Governor and members of the Council.

The Chief Field Officer paid a visit to Singapore on January 19th to see the packing of a trial consignment of graded canned pineapples and inspect the Pineapple Experiment Station.

The Acting Agricultural Chemist paid a visit to Oil Palm Plantations Ltd., Johore, on 21st to 23rd January.

The Assistant Chemist for Copra Research visited Bagan Datoh, Perak and Sabak Bernam, Selangor, on 15th and 16th of the month to give advice concerning the reconstruction of kilns on a coconut estate and to survey the conditions of copra manufacture on small holdings.

Central Experiment Station.

From January 1st 1934, the Government Experimental Plantation, Serdang will be known as the Central Experiment Station, Serdang.

Appointment.

Mr. N. H. Sands has been appointed Acting Agricultural Officer, Perak Central. He assumed duty on January 8th 1934.

Leave.

Mr. H. D. Leighton, Agricultural Officer, has been granted full pay leave for 4 months, 15 days with effect from January 8th., on expiry of agreement.

Statistical.

MARKET PRICES

January 1934.

Rubber.—The market price of rubber has fluctuated during the month, opening at 13⅝ cents per lb. for Spot loose in Singapore and closing at 15⅞ cents per lb. The average price for the month was 14½ cents per lb. in Singapore, 4 13/32 pence in London and 9⅛ cents Gold in New York as compared with 13 9/16 cents, 4 3/16 pence and 8 11/16 cents Gold respectively in December 1933.

Palm Oil.—The course of the market Liverpool/Continent during January on a basis of 5 per cent. f.f.a., c.i.f. was as follows: January 3rd £15 per ton net, January 17th £14 per ton net, and January 24th £14 per ton net.

Prices in the U.S.A. landed weight per pound in bulk c.i.f. New York/Philadelphia were 2.65 cents Gold on the 3rd January, 2.70 cents Gold on 17th January and 2.60 cents Gold on the 24th January.

The price of palm kernels Fair Average Malayan Quality c.i.f. landed weight on the Continent was shillings 7/4½ per cwt. on January 3rd.; shillings 7/3 per cwt. on January 17th. and shillings 7/3 per cwt. on January 24th.

Copra.—There was a further slight fall in price during January. The highest Singapore price for Sundried during the month was $3 per picul, and the lowest price $2.90 per picul, the average price per picul being $2.94 as compared with $3.08 during December. The mixed quality averaged $2.29 per picul as compared with $2.40 per picul in December.

Coffee.—The price at Singapore for Sourabaya coffee remained fairly steady, prices ranged according to grade, from $17 to $19. Palembang Coffee averaged $13.12 per picul during the month, being quoted at $13.50 on the 1st. and a similar price on the 26th; the average figure for December was $12.25.

Arecanuts.—Palembangs averaged $2.94 per picul and Bila Whole $5.75 per picul as compared with $1.96 and $2 per picul during December, the rise in price being very considerable. The range of Singapore prices for other grades was Split $2.25 to $4 per picul; Sliced $6 to $7.50 per picul and Kelantan $3 to $4.50 per picul.

Rice.—The average wholesale price of Siam No. 2 ordinary rice per picul in Singapore in December was $3.18 per picul as compared with $3.31 in November. No. 1 Rangoon rice averaged $3.11 per picul in Singapore in December, the average price for November being $3.10 per picul.

The average retail market prices in cents per gantang of No. 2 Siam rice in December were:—Singapore 23, Penang 26, and Malacca 24 as compared with 24, 27 and 27 respectively in November.

Tea.—During December the average price quoted in London for Malayan tea was shillings 1/1.86. Average prices during December for tea consign-

ments from other countries were as follows:—Ceylon, shillings 1/3.32; Java, pence 11.16; Indian Northern, shillings 1/1.61 and Indian Southern, shillings 1/1.86.

Gambier.—The price of Block gambier remained steady during January, averaging $3.85 per picul, Cube No. 1 averaged $6.35. Corresponding figures for December were $4 and $6.50 respectively.

Pineapples.—There was a further slight increase in value during January, the average Singapore price per case being as follows:—Cubes $3.17, Sliced Flat $3.05 and Sliced Tall $3.13, as compared with $3.14, $3.04 and $3.10 respectively during December.

Tapioca.—The price of Flake Fair averaged $4.85 per picul as compared with $4.45 in December. Pearl Seed averaged $5.60 per picul and Pearl Medium $6 per picul both slight increases on the average prices in December, namely $5.42 and $5.70.

Sago.—Pearl-small Fair again increased slightly in price during January, averaging $3.94 per picul during the month; the price was $3.90 in December. Flour-Sarawak Fair averaged $1.92 per picul as compared with the December average of $1.79 per picul.

Mace.—Prices were nominal during January, the average for the month for Siouw being $65 per picul and $40 for Amboina.

Nutmegs.—100's averaged in price during January $20 per picul, having averaged $19.60 per picul during the previous month; 80's again fell in value, averaging $23.60 per picul, against the figure of $24.40 per picul in December.

Pepper.—Average Singapore prices during January were as follows:—Singapore Black $15.30 per picul; Singapore White $30.50 per picul and Muntok White $32.60; the corresponding figures for December were $13.30, $22.60 and $23.60 per picul respectively.

Cloves.—There was a further fall in the average price of Zanzibar during January as compared with the December price; the January average was $35 per picul. Amboina continued steady as in the previous months at $45 per picul. These are nominal prices.

Tuba Root.—Prices are again firm. Good Rotenone-containing roots averaged $30.50 per picul, while good qualities on the Ether extract basis averaged $24.00.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co., Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Mackie & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY.*

December, 1933.

Malaya.—Gross foreign imports of rice (including stocks available for re-export) during December 1933, amounted to 49,168 tons as compared with 57,402 tons in December 1932, of which 46 per cent. were consigned to Singapore, 18 per cent. to Penang, 9 per cent. to Malacca, 23 per cent. to the Federated Malay States and 4 per cent. to the Unfederated Malay States.

Of these imports, 63 per cent. were from Siam, 24 per cent. from Burma, 9 per cent. from Indo-China and 4 per cent. from other countries.

Total foreign exports of rice from Malaya in December 1933, were 10,579 tons (including 115 tons local production) as compared with 17,876 tons in December 1932.

Of these exports 69 per cent. were consigned to Netherlands India and 31 per cent. to other countries.

Net imports for the period January to December 1933, were 433,956 tons as compared with 409,631 tons during the same period for 1932, an increase of 5.9 per cent.

India and Burma.—Total foreign exports of rice during November 1933, were 103,000 tons as compared with 91,000 tons in the previous month and 100,000 tons in November 1932, an increase of 12 per cent. in respect of the previous month and an increase of 3 per cent. in respect of the same period in the previous year.

Total exports during the period January to November 1933, were 1,758,000 tons as compared with 1,966,000 tons for the corresponding period of 1932, a decrease of 11 per cent.

Siam.—The area under padi at the end of November, 1933, in Siam was 7,542,400 acres as compared with 7,457,200 acres in the previous season. The area damaged was 428,000 acres. The total production was 4,790,100 tons. The surplus available for export is now estimated at 1,641,000 tons of rice and rice products.

Netherlands India, Java and Madura.—At the end of November 1933, the area harvested amounted to 9,096,000 acres an increase of 171,000 acres or 2 per cent. as compared with the corresponding date of 1932; the area damaged was 446,000 acres an increase of 85,000 acres or 24 per cent. as compared with 1932, and additional plantings awaiting harvesting amounted to 2,070,000 acres an increase of 278,000 acres, or 16 per cent. The total acreage at the end of November 1933, amounted to 11,612,000 acres, an increase of 534,000 acres or 5 per cent. as compared with the same period in 1932.

Imports of rice into Java and Madura during January to October 1933, totalled 104,465 tons, a decrease of 17,779 tons or 14 per cent., as compared with the same period of 1932.

*** Abridged from the Rice Summary for December 1933 compiled by the Department of Statistics, S.S. and F.M.S.**

Imports of rice into the Outer Provinces during January to October 1933, amounted to 211,201 tons, a decrease of 8,488 tons or 4 per cent., as compared with the same period of 1932.

French Indo-China.—Entries of padi at the port of Cholon from January to December, amounted to 1,086,000 (metric) tons, a decrease of 27,000 tons or 2 per cent. as compared with the same period of 1932.

Exports of rice from Saigon for the period January to December 1933, totalled 1,221,000 tons, an increase of 29,000 tons or 2 per cent. as compared with the corresponding period of 1932.

Ceylon.—Imports for the period January to November 1933, totalled 398,996 tons, a decrease of 471 tons on the imports for the same period of 1932.

Of these imports 19 per cent. were from British India, and 89 per cent. from other countries.

Europe and America.—Quantities of rice shipped from the East were :—

(*a*) To Europe for the period January 1st to December 20th, 1,233,493 tons, an increase of 223,238 tons or 22 per cent. as compared with the same period of 1932. Of these shipments 46 per cent. were from Burma, 2 per cent. from Japan, 44 per cent. from Saigon, 7 per cent. from Siam and 1 per cent. from Bengal as compared with 52 per cent. from Burma, 2 per cent. from Japan, 38 per cent. from Saigon, 5 per cent. from Siam and 3 per cent. from Bengal in 1932.

(*b*) To the Levant, period January 1st to November 18th 1933, 23,993 tons a fall of 24,069 tons or 50 per cent. as compared with the same period of 1932.

(*c*) To America and the West Indies for the period January 1st to November 26th 1933, 157,543 tons an increase of 39,177 tons or 33 per cent. as compared with the same period of 1932.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS FOURTH QUARTER, 1933.

(As declared by Estates).

	Palm Oil		Palm Kernels	
	F.M.S.	Johore	F.M.S.	Johore
	Tons	Tons	Tons	Tons
1933 October ...	896.0	331.6	154.0	61.0
November ...	851.2	291.8	143.0	50.8
December ...	887.5	225.0	157.5	37.5
Ttotal ...	2634.7	848.4	454.5	149.3

MALAYAN AGRICULTURAL EXPORTS, DECEMBER, 1933.

	Net Export in Tons.			
	December 1932	December 1933	Year 1932	Year 1933
Arecanuts ...	1,731	670	20,288	20,756
Coconuts fresh† ...	11,610	6,507	109,536	100,609
Coconut oil ...	1,281	1,419	11,949	17,568
Copra ...	6,768	13,577	97,277	110,543
Gambier, all kinds ...	172	266	2,926	2,560
Palm kernels ...	150	170	1,248	1,983
Palm oil ...	592	1,635	7,892	12,101
Pineapples, canned ...	6,231	5,242	66,291	59,582
Rubber§ ...	40,974	45,205	417,137	459,836
Sago,—flour ...	974	1,614	8,994	7,648
„ —pearl ...	176	369	3,156	2,646
„ —raw ...	315*	503*	4,199*	4,420*
Tapioca,—flake ...	682	696	9,028	9,881
„ —flour ...	284	332*	393	702*
„ —pearl ...	1,409	1,050	19,879	17,297
Tuba root ...	39½	71½	167	569½

† hundred in number. § production. * net imports.

MALAYA RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING DECEMBER, 1933

State or Territory	Acreage of Tappable Rubber end 1932	Estates which have entirely ceased tapping: Acreage	Estates which have entirely ceased tapping: Percentage of (3) to (2)	Estates which have partly ceased tapping: Acreage	Estates which have partly ceased tapping: Percentage of (5) to (2)	Total (3) + (5)	Percentage of (7) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
STRAITS SETTLEMENTS :—							
Province Wellesley	44,734	1,323	3.0	7,317	16.4	8,640	19.4
Dindings	6,969	209	3.0	759	10.9	963	13.9
Malacca	111,780	4,642	4.2	16,881	15.1	21,523	19.3
Penang Island	1,635	626	38.3	100	6.1	726	44.4
Singapore Island	28,269	9,484	33.5	4,919	17.4	14,403	50.9
Total S.S. ...	193,387	16,284	8.4	29,976	15.5	46,260	23.9
FEDERATED MALAY STATES :—							
Perak	250,951	4,398	1.8	34,156	13.6	38,554	15.4
Selangor	308,379	6,490	2.1	40,549	13.2	47,039	15.3
Negri Sembilan	228,541	7,510	3.3	20,505	9.0	28,015	12.3
Pahang	38,141	5,892	15.4	6,293	16.5	12,185	31.9
Total F.M.S. ...	826,012	24,290	2.9	101,503	12.3	125,793	15.2
UNFEDERATED MALAY STATES :—							
Johore	325,747	21,711	6.7	32,912	10.1	54,623	16.8
Kedah (a)	114,551	3,784	3.3	7,370	6.4	11,154	9.7
Kelantan	21,175	6,237	29.5	2,227	10.5	8,464	40.0
Trengganu (b)	4,352	Nil	Nil	1,561	35.9	1,561	35.9
Perlis (a)	957	177	18.5	468	48.9	645	67.4
Total U.M.S. ...	466,782	31,909	6.8	44,538	9.5	76,447	16.4
TOTAL MALAYA ...	1,486,181	72,483	4.9	176,017	11.8	248,500	16.7

Notes :— (*a*) Registered companies only and are rendered quarterly.
(*b*) Registered companies only.

The above table together with a Summary, was prepared and published by the Statistics Department, S.S. and F.M.S. in January, 1934.

MALAYA RUBBER STATISTICS

TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF DECEMBER 1933 IN DRY TONS.

Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
								during the month		January to Oct 1933		during the month		January to Dec. 1933				
	Ports	Dealers	Estates of 100 acres and over	during the month	January to Dec. 1933	during the month	January to Dec. 1933	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States ...	...	12,983	11,958	12,926	137,363	11,030	110,858	Nil	Nil	Nil	Nil	18,179	5,255	180,004	70,546	...	12,715	12,728
Johore ...	...	3,196	3,244	4,324	44,237	4,748	53,065	Nil	3	Nil	124	1,631	7,397	17,101	79,840	...	3,305	3,182
Kedah ...	...	506	2,234	2,294	28,682	3,698	18,910	Nil	Nil	Nil	Nil	1,655	3,338	15,487	31,634	...	538	3,201
Perlis ...	...	21	14	16	108	45	213	Nil	Nil	Nil	Nil	Nil	53	Nil	323	...	28	15
Kelantan ...	...	309	188	196	2,225	251	6,074	79	Nil	1,128	Nil	68	537	976	8,314	...	215	203
Trengganu ...	...	55	50	90	1,638	45	818	Nil	Nil	Nil	Nil	Nil	135	Nil	2,456	..	55	50
Total Malay States	...	17,070	17,688	19,846	214,253	19,817	189,928	79	3	1,128	124	21,533	16,715	213,568	193,113	...	16,856	19,379
STRAITS SETTLEMENTS :-																		
Malacca ...	...	2,943	1,285	1,561	16,338			Nil		15		3,929		48,884		...	2,734	1,293
Province Wellesley	...	1,307	588	629	6,366			Nil		Nil						...	1,067	602
Dindings ...	...	53	202	122	1,223	3,933	30,711	Nil	16,829	Nil	193,892	8,544	Nil	80,608	Nil	...	59	154
Penang ...	3,995	5,764	9	14	73			1,957		11,380						2,354	5,465	8
Singapore ...	2,542	31,662	123	190	1,851			11,734		115,191		23,573		230,352		5,955	31,110	149
Total Straits Settlements	6,537	41,729	2,207	2,516	25,851	3,933	30,711	13,691	16,829	126,586	193,802	36,046	Nil	359,84.	Nil	8,309	40,435	2,206
TOTAL MALAYA	6,537	58,799	19,895	22,362	240,104	23,750	220,639	13,770	16,832	127,714	194,016	57,579	16,715	573,412	193,113	8,309	57,291	21,585

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
20	21	22	23	24	25	26
DRY RUBBER	9,227	26,458	4,467	3,706	1,290	165
WET RUBBER	3,488	4,652	998	154	2,015	373
TOTAL ...	12,715	31,110	5,465	3,860	3,305	538

TABLE III
FOREIGN EXPORTS

PORTS	For month	January to Dec. inc. 1933
Singapore ...	35,522	353,663
Penang ...	14,048	130,818
Port Swettenham.	7,298	77,199
Malacca ...	711	11,732
MALAYA ...	57,579	573,412

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	during the year 1933
Malay States ... / Straits Settlements	43,271	448,690
MALAYA ...	43,271	448,690

Notes :—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption, *i e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + 20 tons local consumption during the month —[2]—[3]—[4]—[5]—[9]—[10]. For the Straits Settlements, Columns [9] and [10] represent purchases by dealers from local estates of less than 100 acres, reduced by 15 % to terms of dry rubber.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15; wet sheet, 25 : scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.

4. Domestic exports are estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign exports of the later month, the foreign exports of the Malay States being domestic production.

5 The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 23rd January 1934.

METEOROLOGICAL SUMMARY, MALAYA, DECEMBER, 1933.

Locality	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine		
	Means of			Absolute Extremes									Number of days							
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet	Total		Most in a day Amt.	Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Total	Daily Mean	Per cent
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.								
Railway Hill, Kuala Lumpur, Selangor ...	88.6	70.8	79.7	92	68	82	73	82.5	83.7	13.56	344.4	2.25	22	19	4	11		152.15	4.91	41
Bukit Jeram, Selangor ...	86.5	71.6	79.0	89	70	80	74	82.1	84.2	7.04	178.8	2.46	17	15	1		1	153.20	4.94	41
Sitiawan, Perak ...	86.6	71.3	78.9	91	67	78	74	82.2	84.0	6.08	154.4	3.00	16	14	1	1		142.95	4.61	39
Temerloh, Pahang ...	84.8	72.0	78.4	88	69	78	74	82.3	84.4	8.33	211.6	1.86	21	15		1		129.40	4.17	35
Kuala Lipis, Pahang ...	83.9	70.8	77.3	89	69	77	73	81.3	82.9	5.72	145.3	1.97	23	19		23		110.30	3.56	30
Kuala Pahang, Pahang ...	82.1	72.9	77.5	85	70	76	75	79.5	81.7	21.65	549.9	5.33	24	22				135.55	4.37	37
Mount Faber, Singapore ...	84.7	71.5	78.1	89	69	80	73	79.1	80.6	4.49	114.1	0.84	18	14	1			136.65	4.41	36
Butterworth, Province Wellesley ...	86.1	72.4	79.3	89	70	83	74	82.8	84.0	4.35	110.5	1.85	9	9	1	2		180.15	5.81	49
Bukit China, Malacca ...	84.4	72.5	78.5	87	71	78	74	80.6	82.0	9.02	229.1	3.06	15	12	2			151.00	4.87	41
Kluang, Johore ...	84.9	71.0	77.9	89	69	74	73	79.9	81.2	7.35	186.7	2.18	17	15		4		129.55	4.18	34
Bukit Lalang, Mersing, Johore	81.8	71.6	76.7	85	69	77	73	78.7	79.9	9.96	253.0	2.08	21	18		2		132.65	4.28	
Alor Star, Kedah ...	87.0	70.8	78.9	91	67	79	74	82.9	84.3	4.18	106.2	1.84	14	9	2			176.10	5.68	48
Kota Bahru, Kelantan ...	82.9	72.1	77.5	87	69	77	74	80.3	82.1	29.14	740.2	5.88	19	18				131.80	4.25	36
Kuala Trengganu, Trengganu	82.0	71.7	76.9	85	70	73	74	78.7	79.7	30.27	768.9	6.89	24	20		1		127.85	4.12	35
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. Pahang ...	69.9	60.3	65.1	74	58	62	62	70.2	71.1	9.90	251.5	3.23	24	22		21		82.85	2.67	23
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	70.1	54.2	62.1	73	48	65	62	68.0	69.1	6.08	154.4	1.48	18	15		1		102.95	3.32	28
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	69.6	57.9	63.7	73	55	65	60			6.87	174.51	1.44	19	16		2		109.20	3.52	29

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The Director of Agriculture.
The Director, Rubber Research Institute of Malaya.
The Director of Veterinary Research and Veterinary Adviser.
The Assistant Director of Co-operation, South.
The Assistant Director of Co-operation, North.
The Chief Field Officer.
The Agricultural Economist.

THE

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EDITORIAL.

Rubber on Small Holdings

In visualising the future of the rubber planting industry in Malaya, the area planted on small holdings is of very great importance and any information concerning its distribution, yields, and field conditions constitutes most valuable data.

Statistics concerning such areas have improved in recent years, while mainly through the organisation of the Field Branch of the Department of Agriculture, S.S. and F.M.S., our information on the internal economy and the condition of such holdings has accumulated.

There has been a very wide-spread idea that the yields from small rubber holdings are almost bound to decline in future years. The basis for such belief is in the close planting commonly practised; neglect of weeding, drainage and other cultural methods usual on estates; disregard of the diseases which attack the trees; and lastly, wounding of the trees through bad tapping.

Estate practice has, in the past, been at wide variance with the customary methods obtaining on small holdings, but in spite of these differences, which are not so wide as formerly, the yields of rubber from small holdings in Malaya compare favourably with those from large estates.

The questions which concerns us are whether the native producer, in his anxiety to obtain a large crop, is removing bark at too great a rate, so that in future he will find himself without sufficient renewed bark to allow of tapping without resting the trees; whether by deep and careless tapping he is causing premanent injury to the tree; and whether neglect of mouldy rot disease of the tapping panel is so serious as to ruin the trees completely.

The uncertainty which existed concerning these questions led the Rubber Growers' Association in 1930, to approach the Malayan Committee of that body with the suggestion that it was desirable that steps should be taken to inaugurate a series of organised observations of sufficiently wide scope to yield reliable information.

Discussions followed in which the local Committee of the Rubber Growers' Association, the Department of Agriculture and the Rubber Research Institute of Malaya were concerned.

It was eventually agreed that the most effective and efficient manner for performing the work would be to make use of the existing Field Branch of the

Department of Agriculture with additional staff for the taking and compilation of the records and the general supervision of the work.

Discussion with the local Committee of the Rubber Growers' Association resulted early in 1931 in the provision of a grant of $10,000 by the Rubber Research and Propaganda Committee, F.M.S. to enable the work to be undertaken.

Operations were therefore commenced in July of that year when Mr. H. D. Meads was selected to fill the post of recorder in charge of the observations. The actual measurements were completed in the early part of 1933 and the work of computing and collating the large mass of statistics connected with it, by July 1933.

The work has been carried on throughout in close consultation and collaboration with members of the scientific staff of the Rubber Research Institute and in particular with Mr. C. E. T. Mann of that Institute and with the Research, Field and Economics staff of the Department of Agriculture.

In a recently published Special Bulletin of the Department of Agriculture,* Mr. H. D. Meads reports in detail the results of this survey.

Based on the known figures for the State of Johore and on the standard production figures for the last year of restriction (1928), it is probable that of the total area of rubber in Malaya 60 per cent. or 1,879,600 acres is contained on estates of 100 acres and over, 10 per cent. or 313,300 acres on estates of between 25 and 100 acres and the remainder—30 per cent. or 939,800 acres in small holdings of under 25 acres each.

These figures are important because field observations indicate that the quality of the tapping and the consequent bark renewal on estates of between 25—100 acres is equal to that on estates of 100 acres and over. It follows, therefore, that the Report in question concerns 30 per cent. of the total area, or nearly 1,000,000 acres of rubber, in Malaya.

The problems dealt with are two-fold: the rate of bark consumption, and quality of bark renewal.

The investigation shews that the rate of bark consumption on small holdings is nearly 5 inches a year, on the entire circumference of the tree, (4.92 inches is the actual figure).

This allows over 7 years for bark renewal, supposing all tapping not to exceed a height of 6 feet and that tapping is carried out daily throughout this period. It has to be remembered that tapping above this height may be resorted to if circumstances dictate such a course.

Bark renewal depends on the general health of the tree, the quality of the tapping and the incidence of mouldy rot disease.

Systems of planting and cultural methods are not the most important factors in normal bark renewal. On the other hand, bad tapping, causing wounds, results in great irregularity of the surface and is frequently a cause of em-

* Bark Consumption and Bark Reserves on Small Rubber Holdings in Malaya by H. D. Meads. Special Bulletin, Economic Series No. 4, Department of Agriculture, Kuala Lumpur, S.S. and F.M.S., 44 pages, 8 full page illustrations. Price 50 cents (Straits) post free.

barrassment to the tapper when the time comes to tap on renewed bark. In this event the tapper has two alternatives: *viz,* to open tapping on a new panel above six feet, thus allowing extra time for bark renewal, or to give the tree a resting period. The latter course is frequently followed and is rendered possible by the fact that a large number of trees per acre are planted.

There remains, however, one important potential limiting factor on small holdings—the incidence of mouldy rot disease. If measures are not taken to check the disease the bark is destroyed down to the wood. In this way, therefore, there may be grave danger to the future utility of the tree. In earlier days, when treatment of the disease on small holdings was less general than is now the case, the disease was frequently present for a considerable time without treatment and whole sides of many of the trees were without a vestige of renewed bark. Time, however, is a great healer, and we are informed that native areas which suffered from the disease 14 years ago are still normal producers of rubber.

Mr. Meads comments on the danger of mouldy rot disease. He states that even prolonged neglect of treatment of the disease will not necessarily result in rendering any large area of rubber on small holdings permanently unproductive. He adds that the areas in which treatment is entirely neglected are not believed to be very extensive and are likely to diminish rather than extend, owing to the action recently taken by the Department of Agriculture with the object of rendering easily available to small-holders, supplies of cheap disinfectant which is at least effective in checking the damage occasioned by the disease.

After reviewing the evidence presented by the author, supplemented by our own knowledge of the statistical position and observation over some 20 years in Malaya, we can but agree with the conclusions implied by Mr. Meads; that neither by reason of previous neglect nor present practice can it be expected that the production of rubber from small holdings will decline either in the near future or during the next decade.

Varieties of Tuba.

We are indebted to Mr. M. R. Henderson of the Botanic Gardens Department, Straits Settlements, for a contribution in this number on The Sources of "tuba" in the Malay Peninsula.

Derris, or tuba root, is becoming increasingly widely recognised as an insecticide. Recent work in the Department of Agriculture, S.S. and F.M.S. and by investigators in other parts of the world, has elucidated many of the problems which hitherto have prevented a wider use being made of this product. The data supplied by Mr. Henderson deal with the appearance and characteristics of the varieties of tuba found in Malaya.

In view of the fact that the valuable toxic qualities of tuba vary with the variety, the key supplied by Mr. Henderson will be found of value not only to the investigator but to the planter and exporter.

Chinese Market Gardens.

The operations of Chinese vegetable-growers are a familiar sight throughout Malaya. The care and knowledge expended by these industrious people is evidenced by the flourishing crops of many varieties of vegetables produced in these gardens.

Of late years this form of agriculture has increased in extent until today it plays a not unimportant part in the economy of this country. Particular interest attaches, therefore, to an account in this number on "Chinese Market Gardening" which describes the methods by which these striking results are obtained.

It must be admitted that the Chinese use methods which are not always in conformity with modern ideas on health. At the same time, the first step in overcoming this objection must be a complete understanding of the methods of cultivation at present practised; subsequently we can turn our attention to a consideration of means by which such objections may be overcome without injury to an important phase of agricultural development.

The Chinese system of vegetable growing relies on the inter-dependance of cultivation and pig-breeding—with side-lines as such as fish rearing; any one of these industries might fail alone, but worked together they have proved profitable to the Chinese.

An important point in connexion with this industry is that, in the majority of cases, the gardens are established on old worked-out tin-mining land. The natural fertility of such land is low, but the gardeners are able in a few years to bring this soil to a very high degree of fertility and so to effect a permanent improvement of the land.

Original Articles.

CHINESE MARKET GARDENING

BY

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and

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Introduction.

It is a recognised fact that the Chinese are probably the most skilful market gardeners in the world, and that the Western races, in spite of their progress in modern scientific agriculture, can still learn a considerable amount from them.

With this in view, the Department of Agriculture, on the opening of the new Agricultural Station at Cheras near Kuala Lumpur, decided to lay out a portion of the area as a model Chinese market garden. The garden is under the control of the Chinese sub-Inspector of Agriculture, who being trained in western methods of agriculture as well as in his own, has been able to combine the best points of each.

The following notes have been compiled as the result of observations made on the Station and during visits to other Chinese gardens.

Choice of Garden Site.

In the opinion of the Chinese gardeners, the ideal site for a market garden is a piece of flat, rather low-lying land, if possible near to a small stream in order to give facilities for watering and irrigation. Although the land should be low-lying, the soil must be well drained, and hence should contain a fair percentage of sand.

Tools.

The only implement used for cultivation is a digging implement known as a *changkol.* A heavy 5 lb. *changkol* fitted to a handle 5 ft. 6 in. long is used for digging and a lighter 3-4 lb. blade fitted on a 4 ft. 6 in. long handle for weeding. The *changkol* used for weeding has a wider blade than that for digging purposes.

For watering, large wooden tubs fitted with a bamboo or corrugated iron spout are used. Each tub is fitted with two handles through which a rotan is passed, forming a loop some 3 feet high. This serves as a handle for carrying purpose; the usual method of carrying is by means of a *kanda* stick passed through the loops of two such tubs, and supported across the shoulders of the worker.

For applying liquid manures, a small ladle, generally made of galvanised iron and fitted with a handle some 4 to 5 feet long, is used. Each ladle holds about ½ gallon of liquid.

The only other implements that will be seen are baskets of various shapes and sizes which are used for such purposes as collecting the crops and carrying manures.

Coarse organic matter such as *lalang* and other grass is always carried by means of a *kanda* stick and a sling made of bamboo.

Formation of a New Garden.

The land is first cleared by slashing and burning the secondary jungle growth and heavy *lalang* grass (*Imperata arundinacea*). The land is then dug with a *changkol* to a depth of 1 to 2 feet, being left as rough as possible to facilitate the drying out of *lalang* roots. This process is repeated two or three times until practically all *lalang* has been destroyed. A final digging is then given and the *lalang* roots and any tree stumps are removed by hand, collected into heaps and burnt.

Preparation of Beds.

After the land has been cleared, the soil is then formed into a series of ridges or raised beds some 1½ to 2 feet high on which the crops are grown.

The ridges on fairly flat land are straight, but those on hilly land are often V or S shaped, in order to retard soil wash, but in either case, the ridges are equally spaced and parallel.

The ridges after being lightly dug are considered fit for planting.

Preparation of Nursery Beds.

The site of the nursery is always carefully chosen—a rich piece of soil close to an ample water supply being selected. If there is no water supply close to an otherwise suitable portion of land, a pond is generally dug which in many cases is also used as a fish pond. The nursery site is first very carefully dug over—all roots being removed by hand. Manure, generally pig-manure, grass or other organic matter is incorporated into the soil, which is worked up to form a broad flat consolidated bed with a very fine surface tilth.

The average width of a nursery bed is about 4 feet, while the length varies from 20 to 30 feet.

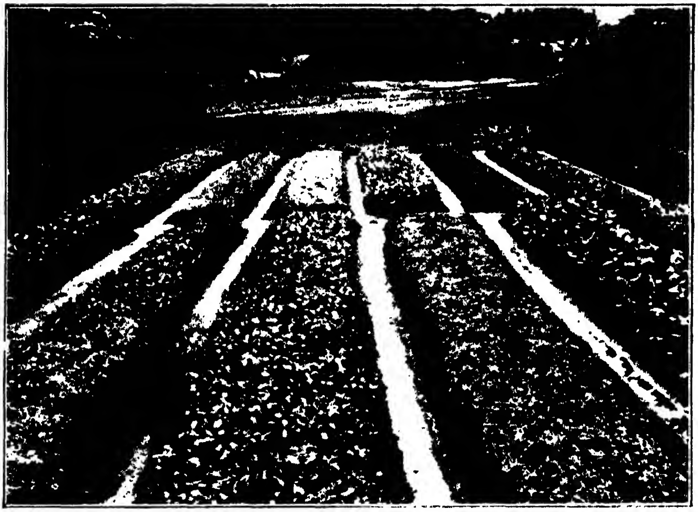
Sowing.

Small seeds, such as chillies and brinjals, are always sown in nurseries, while the larger seeds, such as cucumber and ladies' finger, are sown direct in the field.

Method of making up new beds by splitting old ones down the centre and dragging soil to each side.

TOOLS USED BY MARKET GARDENERS

Front. Carrying-basket made of split bamboo.
On box. Weeding *changkol*, Fork for digging out *lalang* roots, Digging *changkol*.
Behind box. Small spade for digging drains, wells etc. Large split bamboo basket for carrying grass, with a *kanda* stick passed through handles.



A TYPICAL CHINESE MARKET GARDEN

Note the flat and low-lying nature of the land. The beds, however, have been well raised and cultivated so as to ensure adequate drainage.

NURSERY BEDS

Note proximity of water supply—an artificial pond. The pond was also used for breeding fish.

The seeds are first mixed with wood ashes or earth and then scattered lightly over the prepared nursery beds. The bed is then covered to a depth of 1 inch with *lalang* shoots laid lengthwise along the beds, or by *attap* (dried leaf covering).

This covering of *lalang* or *attap* not only protects the germinating seeds from damage by heavy rain and hot sun, but also assists in retaining moisture in the beds. As soon as the young plants have become well established, the covering is removed and replaced by a temporary shelter made by erecting a light wooden frame some 2½ to 3 feet high over the beds and thatching the roof with *lalang* or *attap*. This shed is removed when the young plants are 4 to 5 inches high.

Sowing in the Field.

The larger varieties of seeds are planted in specially prepared pockets of soil on the top of the already prepared ridges. These pockets are made by scraping out little hollows about 3 inches deep and 6 inches in diameter, and refilling with a mixture of black earth (i.e. soil rich in humus) and manure. The seeds are sown in pairs or threes in the centre of each pocket, and covered to the required depth. One or two rows of plants may be planted on each ridge, according to the variety of plant and the width of ridge.

After sowing, the ridges are shaded with *lalang* shoots, or by placing two or three small leafy twigs around each plant until the seedlings are well established.

Transplanting.

When the young plants grown in the nurseries are sufficiently large to handle, they are transplanted in the prepared ridges. The planting holes are prepared in the same way as those for seeds sown directly in the field.

Careful attention is given to the correct spacing of plants in the field, the plants being not only regularly spaced but also at the optimum intervals. These intervals appear to have been carefully worked out many years ago by a method of trial and error, and the knowledge has been handed down from generation to generation.

After transplanting, the young plants are shaded for about 10 days by small leafy twigs or pieces of *attap*.

Secondary Cultivation.

As soon as the plants have become well established and are big enough to be seen easily, the soil between them is kept well broken up by means of a light *changkol*. This secondary cultivation is looked upon as a most necessary task and is repeated at frequent intervals and carried on as long as possible without damaging the plants.

Manuring.

The most commonly used manures are pig-manure, night soil and prawn sweepings. Although the use of night soil is severely condemned by the Health Authorities, there is little doubt that without its aid a large number of market gardens, especially those established on old mining land, would never have been brought to their present high state of fertility. The use of artificial manures to replace night soil is a very recent introduction and is making but slow headway, chiefly owing to the greater cost of such manures.

Pig-manure, and often night soil, is collected in specially constructed concrete pits connected to the pig styes. The majority of these are partly covered to keep out rain, but few are provided with any means of preventing excess of water used in cleaning the styes from mixing with the manure in the pits.

The usual method of applying pig-manure and night soil to vegetables is as a liquid top-dressing, the manure being first diluted with about eight parts of water. When applying manure to crops grown for pig food, such as sweet potato and vines, accurate dilution is not insisted upon, and in such cases all the water used for bathing the pigs and washing down the styes is run into the manure pits. This, together with a certain amount of rain-water that finds its way in, gives sufficient dilution. This diluted mixture is poured round the plants—by means of a small dipper fitted on a long handle—at intervals of about 7 days throughout the growing period.

Prawn sweepings are usually applied either in the holes before the crop is planted, or worked in near the rows as an early top-dressing. The usual rate of application is about 8 kati (12 lbs.) to every 32 holes.

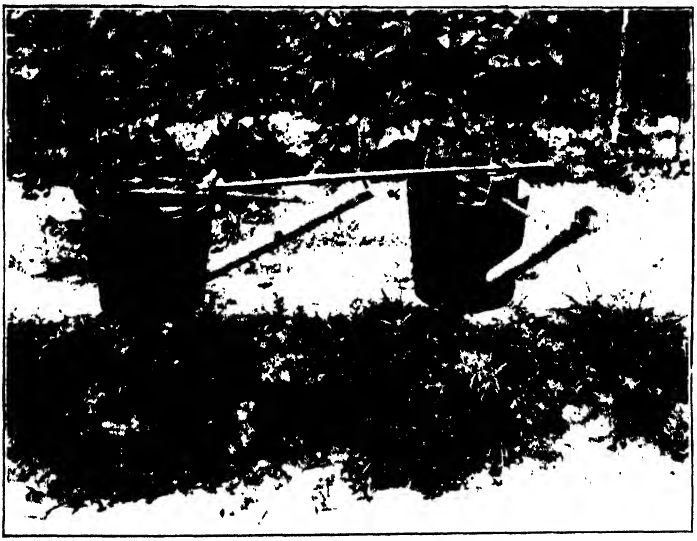
Irrigation and Watering.

The Chinese market gardener seems to possess an inborn knowledge of irrigation and water requirements of his crops, and probably no other agriculturist can decide so accurately, merely by observation, when and how much to irrigate, and when and how often to water the young plants. There is little doubt that the success of a great number of gardens is largely due to this skill.

During dry weather it is the usual custom, whenever possible, for the gardener to irrigate his beds by damming a nearby stream and allowing the water to flood the hollows between the ridges on which the plants are growing. The irrigation water is allowed to remain on the land for 3 to 4 days by which time the soil is judged to be in the right condition.

In addition to irrigating and where irrigation cannot be carried out, the plants are watered morning and evening during dry weather. This work is extremely laborious and entails carrying vast amounts of water, as the gardeners, realising that it is useless just to sprinkle the soil, always make a point of

Method of watering growing crops using two large converted tubs and '*Kanda*' stick.



CHINESE WATERING CANS

THE CHANGKOL SHOWING METHOD OF USING
This is the implement used throughout Malaya for all primary and most of the secondary cultivation.

Method of carrying liquids, using wooden tubs and a *kanda* stick. The small ladle fitted to the end of the stick is used for applying liquid manure.

saturating it. The watering is done by means of large wooden tubs fitted with spouts, each tub holding about 8 gallons of water. This work, in the case of Cantonese gardeners, is generally allotted to women.

Rotation of Crops.

Although no fixed rotation of crops is practised, the same land is never made to carry two successive crops. This is achieved by the simple method, when making up new beds, of dividing the old ones into halves and dragging the soil from half the bed on two adjoining ridges into the hollows between the old beds (as is shown in the accompanying illustration). Thus, the old paths become the centres of the new beds, and the centres of the old ridges new paths. Care is taken while moving the soil from one place to another, not to bring up to the surface raw sub-soil. The new bed so made is never planted with either of the crops previously grown on the two beds from which it was constructed.

Seed Selection.

The Chinese gardener fully realises the importance of sowing good seed. Having first obtained good varieties that grow well on his particular land, he takes great care to preserve the strain, by selecting seeds only from those plants that are above the average. If there are no such plants to be found growing in his garden, he will first try to obtain fresh seed from his neighbours—and if that fails—buy fresh imported seed. Poor, weakly plants are never kept for seed purposes.

Improving the Soil.

If, after one or two crops, the gardener finds that his crops are small and unprofitable, he sows all the poor areas with sweet potatoes followed by yam beans and then by groundnuts, after which he generally finds that he can grow two or three profitable crops. On such lands, large amounts of organic matter, in the form of grass and leaves, are incorporated into the soil in preparing the land for planting. The land once cleared is never allowed to go back into *lalang* and secondary growth as it involves extra labour and expense.

Control of Pests.

Hand-picking and the use of tuba root solution form the chief methods of controlling pests of all kinds. The tuba root solution is made by crushing 4 *tahil* (about 6 ozs.) of tuba root and mixing with 6 gallons of water and is applied by dipping a leafy shoot such as a young bamboo into the mixture and flicking the liquid over the plants. For leaf vegetables, the operation is repeated at intervals of 3 to 4 days throughout the growing season. Ashes are sometimes dusted over the plants as a remedy against moulds and blights. Birds are scared away from seed beds by means of guys—made in exactly the same way as those used in England.

General.

The majority of the Chinese market gardeners in the Federated Malay States are established on old worked-out tin-mining land which is readily drainable and irrigable. The natural fertility of such land is extremely low, and yet it is found that after a few years of working by a Chinese market gardener, a very high degree of fertility is obtained.

The secret for the successful working of such land lies in the abundant use of organic manures, chiefly applied in the liquid form, and frequent deep and thorough cultivation.

Another factor that plays an important part in obtaining good crops from such land is the judicious irrigation and watering of the crops.

THE SOURCES OF "TUBA" IN THE MALAY PENINSULA,

BY

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Two species of *Derris* are commonly cultivated in the Malay Peninsula for *tuba*, 1. *Derris elliptica* and 2. *Derris malaccensis.* The first is a widely spread plant, found from Chittagong through Siam, Cambodia and Malaya to New Guinea and the Bismarck Archipelago. There is some doubt as to whether it is ever found truly wild in the Peninsula.

The second species is a native of the Peninsula and is recorded also from Siam, Tenasserim and Borneo. As grown under cultivation it differs in some important respects from the wild plant, notably in the larger flowers with more hairy calyx and a silky standard, approaching in this respect *Derris elliptica.* For this reason it is proposed to regard it as a variety of *Derris malaccensis* under the name *sarawakensis.* It perhaps would have been better, from a botanical point of view, to have treated it as a species distinct from both *D. malaccensis* and *D. elliptica*, but the name *malaccensis* is now so well known to planters and others in the trade that it would have been confusing to do so. As far as can be ascertained, most, if not all of the stock of *D. malaccensis* now grown here originated in Sarawak or in that neighbourhood. Hence the varietal name, and another name by which it is often known—"Sarawak erect".

As the different kinds of *Derris* differ in their toxic values, it is necessary to have some means of distinguishing them. In the following pages an attempt is made to show how at least the better known and most marked forms or races may be distinguished in the field by leaf characters and habit of growth. An easily-remembered name is attached to each form described.

In the group of true *Derris elliptica,* the variation in leaf-shape is very confusing, even within the same race, and many more races than are given here could be erected on minor differences in leaf-shape, degrees of hairiness and other characters. However, by taking a fairly broad view of what constituted a race, it was found possible to include all the cultivated material seen in the number to be described. After a little practice, these can all be picked out with a fair degree of certainty from a field in which they are growing mixed together.

It must be emphasised that no one leaf from any plant can be relied upon to show all the differentiating points. It is necessary to examine many leaves and to form a general impression of the predominating characters.

The first point to be looked for is the habit of growth of plant. This may be :—

1. Erect, shrub-like, no trailing stems, not forming a cover on the soil.
2. Prostrate, stems trailing on the ground, rooting more or less profusely between nodes and forming a close cover.
3. Prostrate, stems trailing on the ground, habit looser than in 2, stems not rooting profusely, or not at all, not forming a close cover.
4. Prostrate as in 3, but sending up erect or semi-erect woody side shoots.

All *Derris* plants are climbers, and all the prostrate races send up vigorous young shoots which stand semi-erect, but these are to be ignored.

Derris leaves are compound, that is, instead of having a single blade they have many, arranged in pairs along a central stalk, with one terminal one. There is always therefore an odd number of leaflets. That part of the central stalk from the swollen part at the base to the insertion of the lowermost pair of leaflets is called the *petiole* (leaf-stalk) and the rest of the central stalk is the *rachis*. The leaflets are each attached to the rachis by a short stalk called the *petiolule*.

A glance at the drawings will show that the leaves of all the races have a general similarity, but that differences can be observed. The points to look for are :—

1. *Shape of leaflets.* They are usually more or less obovate (inversely ovate, with the broadest part above the middle), but may be ovate (broadest part below the middle), oblong (sides more nearly parallel), or a combination of these shapes. Terminal leaflets tend to be more obovate than the others and the basal one or two pairs tend to be more oblong and reduced in size.

2. *Shape of leaflet tips.* These may be :—

(*a*). A definite rather long narrow point as in fig. 1.

(*b*). A short, quite definite but broad blunt point as in fig. 7.

(*c*). Rounded, or with a very short broad blunt indefinite point as in fig. 8.

3. *Overlapping of leaflets* when a leaf is laid flat.

4. *Degree of hairiness.* All the races dealt with are hairy to some extent, but they vary considerably in the amount present. Very young shoots and leaves are usually densely hairy. In some cases the hairs are not visible to the naked eye, but under a pocket lens, magnifying 8 or 10 times, can always be seen. The hairs tend to drop off as the the leaf becomes old.

5. *Colour of lower surface of leaflet.* All but one of the forms described have a whitish bloom on the under surface of the leaflet. This is quite distinct from any reddish tinge imparted by hairiness.

6. *Number of leaflets.* The number is usually 7 or more. Some races average 7 or 9, rarely more, others 9 or 11 or more, rarely less.

Key to Races Described.

(The number preceding each name is that of the paragraph in which the description of the race will be found).

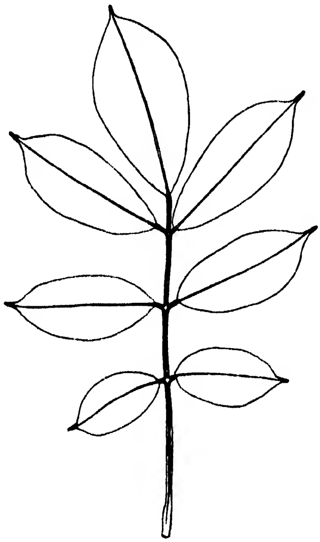

Fig. 1. *Derris malaccensis* var. *sarawakensis.*

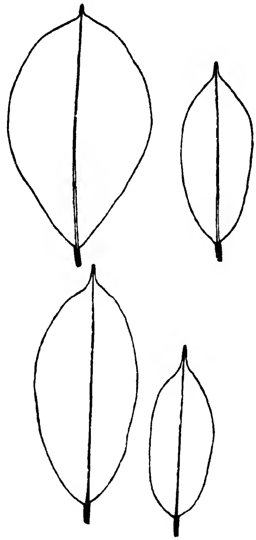

Fig. 2. *Derris malaccensis* var. *sarawakensis.*
Above: Terminal leaflets from same plant.
Below: Side leaflets from same plant.

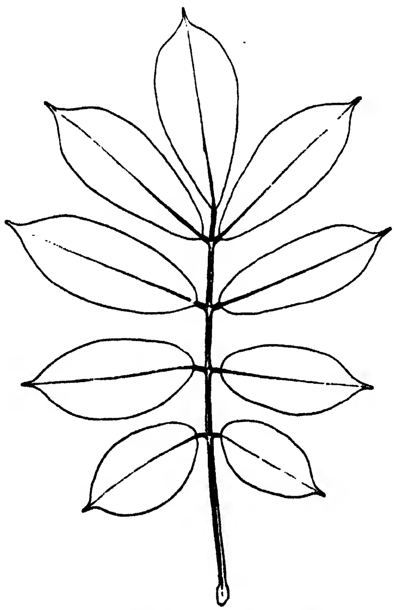

Fig. 3. *Derris elliptica*, Sarawak creeping.

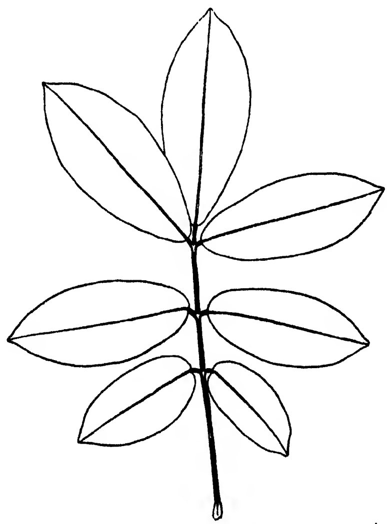

Fig. 4. *Derris elliptica*, Singapore No. 1.

A. Habit erect, shrub-like, leaflets with a definite long narrow point, very sparsely hairy and not white below...............1. *Derris malaccensis* var. *sarawakensis.*

A. Habit prostrate, leaves whitish below:

- B. Stems rooting more or less profusely between nodes, forming a close cover, leaflets with a definite long narrow point, very sparsely hairy below....................................2. *Derris elliptica Sarawak creeping.*
- B. Stems not rooting profusely, not forming a dense cover, leaflets most usually with a short blunt point or rounded:
  - C. Leaflets sparsely hairy below, hairs not or hardly visible to the naked eye:
    - D. Leaflets averaging 7 or 9, not or only slightly overlapping...... ....3a. *Derris elliptica Singapore No. 1.*
    - D. Leaflets averaging 9 or 11 or more, overlapping................. ....3b. *Derris elliptica Singapore No. 2.*
  - C. Leaflets much more hairy below, the hairs, at least on the main veins, distinctly visible to the naked eye:
    - D. Stems with erect or semi-erect woody side shoots, leaflets rather narrow, with a definite short blunt point, rachis usually rather densely hairy.............5. *Derris elliptica Changi No. 2.*
    - D. Stems without erect or semi-erect woody side shoots:
      - E. Leaflets rather broad, overlapping, tending to be oblong, with a very indefinite broad blunt point or completely rounded or with a small notch at the apex.................... ....6. *Derris elliptica Changi No. 3.*
      - E. Leaflets rather narrow, hardly or not overlapping, with a definite broad blunt point.................................... ....4. *Derris elliptica Changi No. 1.*

Preliminary identifications should be made from the key and checked with the descriptions below.

Short Descriptions of Races Mentioned.

1. *Derris malaccensis* var. *sarawakensis.** An erect shrub-like plant, the stems not trailing on the ground or forming a cover. Leaflets 7 or 9, rarely more, rather variable in shape and size, but the side ones usually markedly oblong, the uppermost pair and terminal one usually definitely obovate, tips of leaflets with a definite, prolonged narrow point. Upper surface of leaflets more or less shining, with a few scattered white hairs, visible under a lens, older leaflets often without hairs above; lower surface paler green than upper surface, surface, without white bloom, always with some reddish hair which is more pronounced on the veins and reticulations than on the intervening spaces. Both surfaces appear to the naked eye to be without hair, but a lens will always show

* *Derris malaccensis,* Prain, var. *sarawakensis,* Hend., var. nov. A typo floribus maioribus, vexillo pubescente differt.

some hair on the lower surface. Petiole, rachis and petiolules usually with sparse whitish hairs, or the petiole without hairs, petiolules sometimes brownish, usually green.

Distinguished at a glance from other kinds by its erect shrubby habit, the pointed leaflets without white bloom beneath, and sparseness of hair.

Widely known under the names "tuba rabut" and "Sarawak erect". It has also been wrongly called *Derris chinensis* and *Derris uliginosa.* Figs. 1 and 2.

2. *Derris elliptica Sarawak creeping.* Plant prostrate, forming a close cover, with the stems often rooting profusely between nodes. Leaflets usually 7 or 9, not overlapping when leaf is laid flat, or the terminal one and the uppermost pair overlapping slightly, shape similar to that of *D. malaccensis* var. *sarawakensis*, usually obovate or obovate-oblong, the basal pairs broader, the bases of upper leaflets narrowed and hardly rounded, those of lower leaflets broader and more rounded; tips usually with a definite prolonged narrow point. Upper surface of leaflets shining, without hair or with very sparse whitish hairs visible under a lens; lower surface with whitish bloom and a sparse covering of pale reddish hairs visible only under a lens. Petiole, rachis and petiolules very sparsely whitish or pale red hairy, or sometimes practically without hair, the backs of petiole and rachis without hair. Very young leaves comparatively sparsely reddish hairy.

In leaf shape very similar to *D. malaccensis* var. *sarawakensis,* but the prostrate habit at once distinguishes it. From the forms described below it is distinguishable by its pointed leaflets, dense habit and very sparse hairiness. Fig. 3.

3. *Derris elliptica Singapore No. 1.* Plant prostrate, stems trailing but not forming a dense cover. Leaflets 7 or 9 or more, very variable in size and rather variable in shape, but usually obovate or obovate oblong, the lower one or two pairs reduced in size and broader in proportion than the others; tips usually with a definite short blunt point, the apex of which often has a minute but distinct notch; bases narrowed then rounded, the lowermost pairs often not narrowed. Upper surface of leaflets rather dull, with sparse whitish hairs hardly or not visible to the naked eye; lower surface with a distinct white bloom except on the veins, and with a sparse covering of reddish hairs on the veins and reticulations, hardly visible to the naked eye except as a reddish tinge on the main nerves. Petiole, rachis and petiolules with sparse whitish or pale red hairs, the petiole soon losing them, the back of the rachis without hair.

Distinguished from *Sarawak creeping* by the looser habit, the blunter leaflet tips and the slightly more pronounced hairiness, and from the following forms by the definitely less hairy leaflets and rachis. Figs. 4, 5, 6.

Not many plants have been seen of this race, but they seem sufficiently distinct from the others. Even in the few plants seen it was possible to subdivide the race into

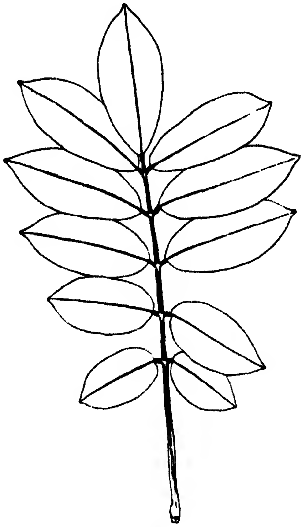

Fig. 5. *Derris elliptica*, Singapore No. 2.

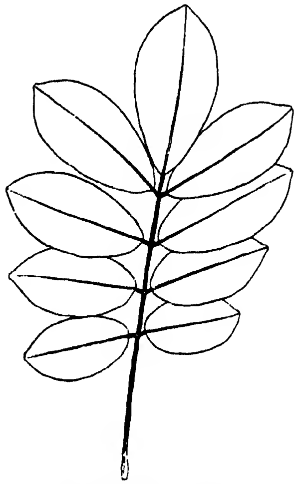

Fig. 6. *Derris elliptica*, Singapore No. 2.

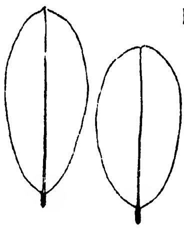

Fig. 9. *Derris elliptica*, Changi No. 3.
Side leaflets.

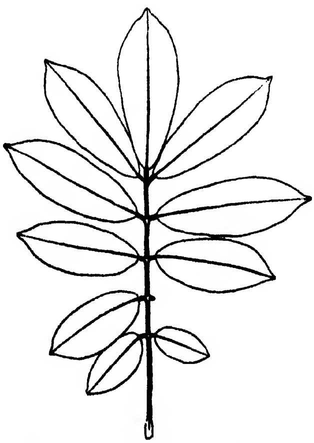

Fig. 7. *Derris elliptica*, Changi No. 1.

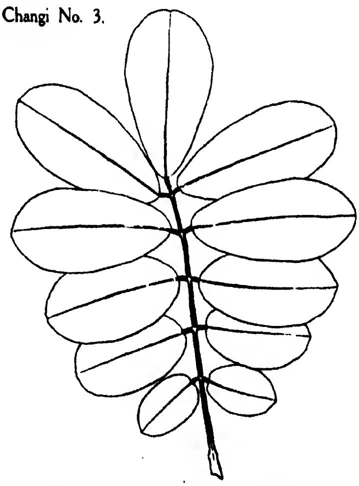

Fig. 8. *Derris elliptica*, Changi No. 3.

a. Plants with leaflets averaging 7 or 9 only, the leaflets rather distant, not or only slightly overlapping when laid flat. Fig. 4.

b. Plants with leaflets averaging 9 or more, overlapping. Figs. 5 and 6.

No other essential difference could be detected between these two sub-forms, but if it is considered advisable to keep them apart, *a* (with 7 or 9 leaflets) may be called *Derris elliptica Singapore No. 1*, and *b* (with 9 or more leaflets) *D. elliptica Singapore No. 2*.

4. *Derris elliptica Changi No. 1*. Plant prostrate with long trailing stems, not forming a close cover or rooting profusely, and without erect woody side shoots, although the young shoots are often erect. Leaflets 9 or 11 or more, rarely less than 9, rather narrowly obovate, the basal leaflets broader and more oblong, often reduced in size, the upper leaflets very definitely narrowed to a rounded base; leaflet tips with a definite short blunt point, the apex often minutely notched. Leaflets not or only slightly overlapping, texture rather thick, upper surface dull, always with some scattered white hairs especially along the veins, hardly visible to the naked eye; lower surface with whitish bloom, rather densely hairy, particularly on the veins, the hairiness easily visible to the naked eye, though it tends to become sparser in older leaves. Young shoots and leaves densely red hairy. Petioles, rachis and petiolules rather densely to sparsely whitish or pale red hairy, the back of the rachis usually with some hair.

Distinguishable from *Sarawak creeping* by its looser habit, bluntly pointed leaflets and increased hairiness, from *Singapore Nos. 1 and 2* by its narrower and somewhat thicker leaflets and increased hairiness and by its slightly longer leaflet tips.

This is the form most generally cultivated in Singapore. The Chinese name *Ney Kee* is given for it. Fig. 7.

5. *Derris elliptica Changi No. 2*. This form is very close to *Changi No. 1* and very difficult to separate from it on leaf characters alone. The same description would fit leaves of both, except that those of *Changi No. 2* tend to be slightly broader towards the base of the leaflets, the leaflet tip is slightly shorter and broader, and the hairiness appears to be always somewhat more pronounced, with the petiole and rachis definitely more hairy, the hairs persisting longer on the backs of both. The chief difference is in the habit of growth. *Changi No. 2* has erect woody side shoots, and in a field where *Changi No. 1 and Changi No. 2* are growing together, the latter can be picked out with some degree of certainty by this character alone.

Changi No. 2 is disinguishable from *Singapore Nos. 1* and *2* by the narrower, somewhat thicker, and much more hairy leaflets.

The Chinese name *Lui Ting* is given for this form.

6. *Derris elliptica Changi No. 3*. Plant prostrate, stems trailing but not forming a dense cover, and without erect woody side shoots. Leaflets 9 or more, rarely less, usually distinctly overlapping, obovate to obovate oblong, the bases

only slightly narrowed and then rounded; leaflet tips very blunt, sometimes with a very short broad blunt point often notched at its apex, or rounded with no point and notched, or rounded and not notched. Upper surface dull, usually with a few scattered white hairs, especially on the veins, visible under a lens, often without hairs; lower surface with a dull, rather dirty white bloom, reddish hairy especially on the veins, hairiness visible to the naked eye. Petioles, rachis and petiolules sparsely to very sparsely reddish or dirty white hairy, in the older leaves losing most of their hair, in younger but fully developed leaves the backs of the petioles and rachis sparsely hairy.

Distinguished from *Singapore Nos. 1* and *2* by the somewhat thicker, usually smaller leaflets with distinctly more hair below, and by the blunter leaflet tips, and from *Changi Nos. 1* and *2* by the broader leaflets not so markedly narrowed to the base, the much blunter leaflet tips and the sparser covering of hair.

The Chinese name *Low Ting* is given for this form. Figs. 8 and 9.

American botanists have adopted an older name—*Deguelia*—for *Derris*, which may cause some confusion. However, according to the code of rules of nomenclature followed by most British and Continental botanists, *Derris* is the correct name to use.

I am indebted to Mr. J. N. Milsum, Central Experiment Station, Serdang and to Mr. G. P. D. Olds, Agricultural Officer, Singapore, for much help and advice; and to Messrs. Cooper McDougall & Robertson, Ltd., Bentong, the Senai Rubber Estate Co., Ltd., and Mr. George D. Mackay, Singapore, for specimens and information. I have also to thank the Director, Royal Botanic Gardens, Kew for identifying certain specimens; the Director, Algemeen Proefstation voor den Landbouw, Java, for a set of specimens, and the Curator, Sarawak Museum, for the loan of material from Borneo.

THE AVOCADO PEAR

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The Avocado Pear is a comparatively recent introduction to horticulture although it has been cultivated in Mexico and Central America from very early times. In these countries the fruit is cultivated around dwellings, no large plantations exist and very little care has been taken with its cultivation (1). During the last thirty years or so, horticulturists in California and Florida have devoted attention to its cultivation and the vegetative propagation of superior varieties. In these two States the cultivation of the Avocado has become of commercial importance. It is also cultivated largely in the West Indies and Hawaii.

The commercial aspect of Avocado culture has been especially emphasised since 1910 (2) when explorers from the United States of America were sent to Mexico and Guatemala to obtain the best varieties cultivated in those regions. The California Avocado Association, which was organised in 1915, has influenced the development of the industry (2) and its committee has rendered valuable service by the registration and classification of varieties. The Year Book of this Association for 1931 contains a list of 400 varieties including names of Avocados published in the West Indies and Hawaii (3).

A co-operative marketing agency, founded by the Calavo Growers of California, in 1924, assists with the marketing of the fruit, and a similar organisation exists in Hawaii, shipping the fruits to American markets (7).

The Avocado is now cultivated in most tropical and sub-tropical countries although it has not yet become as popular elsewhere as it is in America.

The date of the introduction of the Avocado into Malaya is uncertain, but Ridley (4) mentions that trees were fruiting in Singapore in 1902. The Avocado was also being cultivated at the Government Experimental Plantation, Kuala Lumpur in 1908 (5). A few of these trees fruited in 1913 and, early in 1914, the present writer (6) advocated extending the cultivation of the fruit. Since that date the Avocado has been grown on a small scale in different parts of the Peninsula and has fruited well both in the plains and at the "Gap" 2,800 feet above sea-level. During the last decade, seedlings have been distributed by the Department of Agriculture; in spite of this fact, the fruit is not as widely known, even among Europeans, as it deserves to be. This is probably due to the fact that a taste for the fruit has to be acquired, in consequence of which it is rarely seen in the local markets.

Botanical.

The Avocado Pear belongs to the Natural Order *Lauraceae* and is therefore related to the Cinnamon. The varieties under cultivation are of two species, viz. *Persea gratissima,* Guertn (syn. *P. americana,* Mill.) and *P. drymifolia,* Cham. and Schlecht (syn. *P. americana* var. *drymifolia,* Mez.) The former species include the West Indian and Guatemalan types or races and the latter the Mexican types (1).

It is a tree of medium size, attaining a height of 20 to 30 feet under cultivation, but in Central America it is recorded that old trees reach a height of 60 feet (1).

The tree may be either erect, compact, or spreading in habit. The bark of the trunk and older parts of the branches are grey in colour while the tips are smooth and green. The leaves are alternate, crowded near the ends of the branches and vary in shape from lanceolate to ovate or even obovate with blunt to acuminate tips. The blades of the leaves vary from 3 to 4 inches to as much as a foot in length, light to dark green in colour, smooth and shining above and glaucous beneath. The flowers are small, yellowish-green in colour, complete with both stamens and pistils, and they are borne in racemes near the ends of the branches.

Stouts (9 and 15) investigations on the Avocado have enabled him to classify varieties into two groups (1) those (Group A) in which the flowers function as pistilates or females in the forenoon and staminates in the afternoon and (2) those (Group B) which function as males in the forenoon and females in the afternoon. The flowers open synchronously in sets and there are normally two periods of opening. In Group A the first period of opening takes place in the forenoon when the stigmas are receptive. These flowers close at about midday and open again for the shedding of pollen in the afternoon of the following day. In Group B the flowers open for the first or female phase in the afternoon, close in the evening, opening again for shedding pollen on the following morning or on the morning of the third day. There is a certain amount of overlapping as regards opening and closing of flowers, especially under unfavourable weather conditions when the first and second openings of the flowers are often delayed. Some varieties have been found to produce excellent crops of fruits in the absence of trees of another group, but despite these observed instances in which trees are not dependent upon cross-pollination, Stout considers that interplanting of reciprocating varieties is normally advisable to ensure that proper pollination takes place which is essential to the production of fruit.

Varieties.

The varieties of both species of Avocado are closely alike in many respects; the differences between the different races are briefly as follows (1):—

1. Leaves anise-scented, skin of fruit thin and membranous (rarely more than 1/32 inch thick)—*Persea drymifolia.* The Mexican race.

2. Leaves not anise-scented, skin of fruit thicker (from 1/32 to 1/4 inch in thickness)—*Persea gratissima*:
(*a*) Fruit ripe in summer, skin usually not more than 1/16 inch thick, leathery in texture—West Indian Race.
(*b*) Fruit ripening in winter and spring, skin 1/16 to 1/4 inch thick, woody in texture—Guatemalan Race.

The Mexican race is a native of the Mexican highlands and will therefore withstand cold conditions.

The West Indian race has been developed in the tropical lowlands of Guatmala, while the Guatemalan race is a product of the highlands, but there are intermediate forms.

Other distinguishing characters are that the flower of *P. drymifolia* is more pubescent and the underside of the leaf more glabrous than that of *P. gratissima*. The fruits of both species vary in size, but those of *P. drymifolia* are usually smaller than those of *P. gratissima*. They vary in size from a few ounces to three pounds; in shape from round to oval and pear-shaped, and in colour from green to purplish-black. The fruit is a drupe having a single large seed, often 2 inches in diameter, in the centre. The edible portion of the fruit is between the skin and the seed, and when ripe is of the consistency of butter, cream-coloured to green near the skin, of a nutty flavour and contains a large percentage of fat.

The varieties cultivated in Malaya vary considerably in size, shape, and also colour of the fruit, but the majority belong to the West Indian race. The Mexican type is little known, but a few seedling trees are growing at the Central Experiment Station, Serdang, although they have not yet fruited. In Malaya, the West Indian varieties are suitable for cultivation from sea-level up to an elevation of about 3,000 feet. The Guatemalan varieties are said to withstand both cold and heat, also a dry climate, while the Mexican varieties are said to withstand a few degrees of frost. These two races may thrive at higher elevations in this country.

In selecting varieties for cultivation, preference should be given to those with fruits of medium size, say 12 to 16 ounces. The fruit should be of good flavour, the skin tough, leathery and of moderate thickness, so that they will withstand transport for some distance. The seeds should be small and not loose in the cavity otherwise the flesh may be injured in transit.

Propagation.

Propagation locally has been by seed, but the disadvantage of this method is that the offspring cannot be relied upon to come true to the parent type; the Avocado is therefore usually propagated by budding or grafting.

Attempts have been made to propagate the Avocado by marcottage but so far without success, although it is reported that, after numerous failures, well-rooted plants have been obtained by this method in the Philippines (10).

By planting seedlings in beds and laying them down for propagation by the etiolated shoot method, rooted shoots have been obtained, but so far the difficulty in obtaining authentic planting material has made this method impracticable. A stock of budded material is, however, being raised by this Department and will be available in the rear future, when budded plants of known origin have been established by the eteolation method may prove useful for rapidly increasing supplies of reliable planting material.

The most common method of propagation is by budding and grafting, and the best stocks to use for this purpose in Malaya are seedlings of our local varieties. In California, the Guatemalan race has been budded on to stocks of the Mexican race with the object of giving hardiness to the former, but in the even climate of the plains of Malaya hardiness is a point of little if any importance.

Raising Stocks.—The seeds should be planted as soon as possible after removal from the fruit. They should be planted pointed end upwards in loose sandy soil, in boxes or seed beds and after germination the seedlings should be transplanted into large bamboo pots or into nursery beds at about 18 inches apart. Germination takes place in a short time and seedlings are ready to bud in six to eight months, when the stems will be about one half inch in diameter. It is essential that seedlings to be used as stocks should be maintained in vigorous growth.

Budding Methods.—Several methods of budding Avocados are recommended and have been successful in other countries. It should be borne in mind, however, that skill and patience are required, and above all a very sharp budding knife. For the benefit of those who do not understand the various methods of budding, they are described briefly as follows:—

The "inverted T" method is performed by making a "⊥" shaped incision in the bark of the stock an inch or two from the ground with the blade of a sharp knife. Budwood is then procured from a shoot of recent growth not soft enough to snap when bent but beginning to mature. The buds should be plump but not bursting into growth. The knife should then be inserted about an inch below the bud and drawn upwards and inwards beneath the bud, bringing it out about the same distance above the bud. A shield-shaped piece of bark with a section of wood attached is then obtained. The section of wood should be carefully removed and the bud attached to the piece of bark inserted into the incision in the stock. The bud is then bound firmly in place with raffia or a thin strip of waxed cloth, taking care not to cover the bud completely. In about three weeks from the time of budding the tying material should be removed and if, on examination, the bud is found to be green it should be retied but not tightly, and at the same time the apex of the stock should be pinched out. The bud should be examined again at the end of six weeks and if it is still alive the wrapping may be removed. At the same time the stock may be cut back still further, but some leaves should be left. The stock should not

be cut back completely until the bud shoot is about 2 feet in length. When cutting back the stock, a neat cut should be made close to the union between bud-shoot and scion and the wound should be covered with some protective material such as grafting wax.

Other methods of budding recommended differ only in the shape of the incision in the stock. The Forkert method, a modified form of rectangular patch budding, has been used successfully in Java (12) with buds from non-petioled ripe budwood. The method consists in making three incisions in the stock, two parallel downwards and one across the top, forming three sides of a rectangle. The bark is then raised carefully, gripped between the blade of the knife and the thumb and stripped downwards. Three quarters of the flap of bark is then cut away. A piece of bark of the same size and shape as the incision in the stock containing a bud is then inserted and tied into place. The subsequent procedure is the same as for the inverted "T" method.

Grafting.—In Florida (1) the Avocado has been propagated by grafting the tips of young shoots on to the shoots of young seedlings by a modified method of side-grafting. The operation is performed as follows:—The seeds are germinated in boxes and, when the young shoots are 5 to 6 inches in length, the seedlings are taken from the box and laid on a bench. A cut one inch long is made in the side of the shoot just above the seed and a thin section is removed. The scion is taken from the tip of a small branchlet not fully mature and about one inch long with two axilary buds in addition to the terminal one. The scion is then tapered on one side to fit the cut on the stock and is bound into place. The plant is afterwards potted, placed under partial shade and carefully watered from day to day. After union is effected the top of the seedling is removed and the scion allowed to grow.

Cleft Grafting.—Cleft grafting is used on young stocks and in top working older trees. For grafting on to young stocks the scion should be a partially mature shoot, greenish to light brown in colour and about 4 to 5 inches long. This should be tapered at the lower end and inserted in a cleft in the top of a stock of the same colour and size as the scion (10).

Top Grafting.—This method is used in cases where a tree has proved to be unfruitful or is of an inferior variety. The trunk is cut back with a saw to within three feet of the ground. The trunk is then split, a saw being used to cut down for several inches when a soft wood wedge is inserted and driven in until the trunk commences to split; the edges of the cleft are then smoothed with a knife. Scions of mature growth are then cut and tapered to fit the cleft, one on each side of the trunk, so that the cambiums of both stock and scion are in contact. The wedge is then lifted sufficiently to allow enough pressure from the cleft in the stock to hold the scion in place, after which the wedge is cut off flush with the top of the stock. The cleft and sides of the stock are then covered with grafting wax to prevent the entrance of water. To prevent sun-scorch the top of the stock end the scion is covered with a tough

paper bag, holes being made to allow new growth from the scion to elongate. Another method is to place a paper collar round the top of the stock and fill it with sand, holes being made in the base to allow drainage of rain water. The sand should be placed round the outside of the scion as well as at the top of the stock. These paper coverings should not be removed until the scion is large enough to provide shade. A certain number of shoots from the stock may be allowed to grow to maintain circulation of sap which assists healing. They should be eliminated as soon as the scion and stock have properly united.

Another method of top working old trees is to cut back a certain number of branches leaving one or two as "lungs" to maintain the circulation of sap. The young shoots, which sprout from the cut branches, should be limited to two or three; when large enough, they are budded in the same manner as seedling stocks.

Soils and Cultivation.

Soils.—The Avocado is said to thrive on a wide range of soils in South America. It grows excellently on both sandy soils in Florida and heavy clays in California, but it is essential that the soils should be well drained. In Malaya it has been grown successfully on both quartzite hill and quartzite valley soils, also in the granite soils of the hills.

Planting.—The distance at which to plant will depend upon whether the soil is particularly fertile or rather poor, also on whether the tree is a seedling or has been propagated vegetatively by budding or grafting. Planting distances recommended are 20 ft. x 20 ft. which allows 108 trees per acre to 26 ft. x 26 ft. or 64 trees per acre. On light sandy soils or with budded plants 20 ft. x 20 ft. is usually sufficient, but seedlings on rich soil may be given the wider spacing.

When planting it is advisable to make large holes, and these should be filled with good top soil and cattle manure or garden refuse. Usually holes 2 ft. x 2 ft. x 2 ft. should be dug and when filling them the soil should be made quite firm.

The Avocado is rather sensitive to disturbance of the roots; plants should therefore be raised in bamboo pots, so that they can be transplanted with the roots intact. If raised in nursery beds the plants should be prepared for transplanting by balling a week or two before this operation takes place. Should the roots be at all disturbed the foliage should be reduced or evaporation will be too rapid and the plants will receive a severe check.

The best time to plant is during the rainy seasons of the year; even at this time a good watering should be given to settle the soil round the roots and the plants shaded until they are established.

After-cultivation consists in keeping the soil round the plants free from weeds and, as the trees develop, the area weeded should be extended. A mulch of weeds and cattle manure is beneficial to the growth of the plant. The Avocado requires good cultivation and manuring to give the best results. Cattle manure, if obtainable, is best for general purposes. The growing of leguminous

green crops and turning them into the soil periodically will help considerably towards keeping the soil fertile. In addition, fertilizers are recommended (1) in the form of bone meal, and cotton seed or groundnut cake at the rate of 4 or 5 lbs. per tree added to the soil after the trees have borne fruit, and again after the fruit is set. Little is known about the manuring of the Avocado in Malaya, but in addition to cattle manure a mixture of basic slag, calcium cyanamide and sulphate of potash in the proportion by weight of 3 : 1 : 1 : may be applied twice a year round the trees at the rate of from 1 to 4 lbs. per tree according to age. If the trees appear to be growing vigorously, the calcium cyanamide may be omitted.

Pruning.—Very little pruning is necessary beyond that which is essential to keep the tree in shape, and the cutting out of dead or diseased branches.

Pest and Diseases.

In Malaya the Avocado Pear has so far been remarkably free from pests and diseases. In America, thrips, *Heliothrips rubrocinctus* and *H. haemarrhoidalis* have caused damage to the foliage, but spraying with nicotine solution has been an effective control. The red spider, *Tetranychus mytilaspidis* has also done damage but lime sulphur mixture has been used successfully in combatting this pest. Attacks by scale insects are also reported from America.

A root disease, *Sphaerostilbi repens*, has caused the death of several trees at the Central Experiment Station, Serdang, and a certain amount of die-back of branches has been noticed.

The Crop.

The Avocado tree, when raised from seed, commences to bear fruit in about the fifth or sixth year from planting, but budded trees are reported to bear fruit much earlier, in some cases, three years after planting. Seedlings planted at the Central Experiment Station, Serdang, in October, 1927 fruited in August and September, 1932. Others planted in April, 1928 fruited in August and September, 1933, while one tree planted in September, 1929 fruited in September, 1933.

Mature trees will bear from a few fruits up to several hundred. Large trees, in their country of origin, are said to bear from 1,000 to 3,000 fruits from 6 to 18 ounces each in weight. Trees bearing larger fruits bear less, the average, however, is said to be 200 to 300 fruits of 12 to 14 ounces each in weight.

Seedling trees vary considerably in their capacity for bearing fruit, they are also said to be irregular in bearing, for a tree bearing a good crop one year may not fruit the next. This is the case at the Central Experiment Station, Serdang, where only about 50 per cent. of the trees have borne fruit in 1933 and of these about half have borne an average crop, others a few fruits only. The fruits from different trees varied in size from 3 to 4 ounces up to 14 or 16 ounces; in colour from green to purple; the skins of the fruits of some trees

were quite smooth while others were rough. None of the trees bore very large fruits compared with varieties under cultivation in the countries of origin, California and Florida, where it is reported that varieties bear fruits up to 3 lbs. in weight.

The Avocado Pear at Serdang commences to flower about the middle of January and the fruits ripen in August and September. There is some difficulty in judging when some varieties are ripe, especially those with green skins. With the purple varieties there is not so much difficulty, for the fruits are green until they commence to ripen, when the colour gradually changes to a purple tinge. The fruits should be picked before they commence to soften, more especially if they are to be transported some distance to a market. Fruits picked when too under-ripe may shrivel slightly, but if picked when nearing maturity they may be stored until they soften.

Methods of Preparation for Food.

In its country of origin (8) the Avocado Pear forms an important article of diet to the population who use it daily throughout more than half the year. An Avocado and a few small corn cakes made from coarsely ground maize is considered, by the Indians of Guatemala, to constitute a good meal. The fruit is broken in half and the pulp, sprinkled with salt, is scooped out of the skin either with the fingers or a piece of corn cake. Among the Guatemalans of European blood, the pulp of the Avocado is usually added to meat soups at the time of serving and the flavour imparted is said to be exceedingly pleasant. Another usual practice is to serve a salad composed of thoroughly mashed Avocado pulp, vinegar, salt, pepper and finely chopped onions. This is said to be a popular and very tasty dish though not especially attractive in appearance.

In the United States of America, where the fruit is increasing in popularity, the pulp is used as a salad either alone or mixed with lettuce leaves, onions or other vegetables. Sliced or mashed it can be made into sandwiches with bread or cracker biscuits. It is excellent as a salad, either with cold meat or with bread and butter, when mashed and mixed with pepper, salt, and vinegar. Mashed with onions and lime juice it constitutes a favourite dish in Cuba. In Brazil it is looked upon more as a dessert fruit and is also made into ice-cream. The pulp of the fruit, mixed with a little sugar and sherry, has a pleasant nutty flavour and in this way can be used as a dessert.

Food Value.

The flesh of the Avocado is a nourishing article of food containing a high percentage of mineral matter, protein and fat. Its chief value as a food is its high fat content, the digestibility of which has been found by experiment to be equal to that of butter fat or of beef fat.

The calorific energy producing value of 28 varieties of Avocado examined at the University of California represents 1,000 calories for one pound of flesh. The maximum and minimum were 1,325 and 597 respectively. The maximum corresponds to 75 per cent. of the calorific value of cereals and is nearly twice that of lean meat.

The following table from Popeno's Manual of Tropical and Sub-Tropical Fruits represents the work of Jaffa of the University of California on the food value of the Avocado :—

Variety.	Water. per cent.	Protein. per cent.	Fat. per cent.	Carbo-hydrates. per cent.	Ash. per cent.
Trap (West Indian) ...	78.66	1.61	9.80	9.08	0.85
Sharpless (Guatemalan) ...	71.21	1.70	20.54	5.43	1.12
Puebla (Mexican) ...	63.32	1.80	26.68	6.64	1.56
Fuerte (Hybrid) ...	69.86	1.25	29.14	7.40	1.35

Recent investigations by Le Roy Weatherley and Eugene W. Waterman of the University of California (14) using Albino rats as indicators, has demonstrated the presence of Vitamin "B" in the flesh of the fruit. The flesh or pulp was compared with Flesschmanns dry yeast standard and was found to have approximately one-twelfth the value of dried yeast. The authors comment as follows :—"From these investigations it is apparent that the Avocado ranks high as a source of Vitamin "B". If what is known as Vitamin "B" is in reality two vitamin factors one antineuritic and one growth promoting, as recent investigations seem to indicate, it is evident that the Avocado contains both factors since it prevents paralytic symptoms".

Summary.

1. The distribution, botanical, and distinguishing features of the different races of Avocado are discussed.

2. The different methods of propagation of the Avocado are given together with notes on its cultivation.

3. The methods of preparation, food value, and vitamin value of the Avocado are given.

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Miscellaneous Article.

Growth of the Soya bean Industry in America and its Effect on the Malayan Copra and Palm Oil Trade.

The United States of America have in past imported substantial quantities of copra and palm oil from Malaya and other tropical countries and despite the prevailing depression, exports of this produce from Malaya to the United States have been maintained even though there has been a marked decrease in the export in the year 1932 as the following figures show:—

		1930	1931	1932	1933
		tons	tons	tons	tons
Copra	...	27,579	23,350	10,579	17,618
Palm oil	...	772	1,267	925	2,991

It has, from time to time, been suggested in the United States of America that the importation of these products competes with local dairy produce and recently there has been a further revival of this contention in a more acute degree.

Foreign oils and fats, other than coconut oil, in 1932 constituted only 56-100 of 1 per cent. of the foreign oil ingredients of oleomargarine in the United States of America, while only 5½ per cent. of the edible oil and fat consumption of that country in 1932 was of foreign origin and most of this was used in the baking and confectionery trades. Practically all the imported oils and fats are the necessary raw materials of industries which are producing manufactured products of a non-edible nature, such as paint, varnish, soap, linoleum, tin-plate, and tanners of oils.

The above are the industries in the United States which absorb the bulk of the imports from Malaya of the products from the coconut palm and the oil palm. It is evident that there is not at present any real grounds for a conflict of interests with dairymen.

In the post-war period, the United States of America has been the largest single consumer of coconut oil, absorbing about one-third of the world's supplies, and the restriction of imports of copra and palm oil into the United States would undoubtedly have a marked effect on these industries in the producing countries.

The demand for coconut oil depends largely on the expansion of the soap industry and on the competition of other vegetable oils and fats and animal and marine fats used in this industry. The same applied, in a large measure, to palm oil, although in this case, it is believed that it is finding increasing favour in the United States for edible purposes.

In the *Malayan Agricultural Journal* published in March, 1933, the questions of the substitution of other oils for coconut oil and palm oil is discussed in abstracts from a report by (1) The Empire Marketing Board and (2) The United States Tariff Report on Certain Oils.

These reports, however, do not include figures relating to the growth of the soya bean industry in the United States which have recently been published in *The Journal of Chemical Education,* Vol. I, No. 10 (January 1933).

It appears from this article that the area under soya beans in the United States has increased from 50,000 acres in 1917 to 3,497,000 acres in 1931, and that this crop, which was formerly grown as a forage crop, is now grown to a large extent for crushing purposes. The quantities of beans crushed in recent years have been as follows:—

1925—26	—	10,520 tons.
1926—27	—	10,036 „
1927—28	—	16,728 „
1928—29	—	26,448 „
1929—30	—	48,038 „
1930—31	—	121,455 „

If the importation of copra and oil palm products into the United States is restricted in order to encourage home production of oil-producing crops, it is not improbable that the demand for coconut and oil palm products in the United States will in the future tend to diminish.

Abstract.

AGRICULTURE IN THE PHILIPPINE ISLANDS.*

The Governor-General, Theodore Roosevelt, arrived in the Philippines on 29th February, 1932, when it was found that the Government expenditure for 1931 had exceeded the revenues by 7,200,000 pesos. He, therefore, set out to familiarise himself with the country and its problems by personal inspections and contact with the leading citizens. As a result of his energetic investigations, he concluded that immediate action must be directed towards a balanced budget, a re-organisation of the Government on lines of greater economy and efficiency and a revision of its revenue system. He realised, at the same time, that positive action must be taken to develop and foster industries in order to lay a broader base for prosperity in the future. He recognised that particular attention must be devoted to the welfare of the small-holder who was most seriously affected by the crisis as the Philippines are primarily dependent on agriculture, the basic products on which the wealth of the country depends being copra, rice, tobacco, hemp and sugar. Since 1929 the prices of all these products had depreciated very heavily.

By March, 1932, it became apparent that 1932 revenue would fall short of the estimates by over 17 million pesos; consequently, the Governor-General laid the situation before his councillors and immediate steps were taken to effect economies estimated at over 6 million pesos or approximately 20 per cent. reduction in the latter six months of the year. Resulting from the adoption of these economies, coupled with an unexpected gain in customs revenues due to heavy imports in anticipation of increases in tariff rates, the year 1932 ended with a surplus balance. In addition to the executive action described above, legislative action was taken to eliminate duplication of duties as far as possible.

For the purpose of balancing the budget in 1933, a further reduction of 24 per cent. was made in the operating cost of the governmental machinery, thus reducing the estimates to a total of 42,000,000 pesos.

In addition to this heavy reduction, the Governor-General was empowered to reduce all or any part of a budget by 10 per cent. should it be found necessary in order to ensure that expenditure did not exceed income and it was enacted that no new public works should be initiated without the approval of the Governor-General. It is worthy of note that in effecting economies and in providing for the continuation of the machinery of the government, no serious consideration was given to any suggestion that deficits should be met by borrowing, but that necessary steps were courageously taken with a clear sight of the basic needs of the situation.

The land tax, which forms the main source of support of the provincial governments, became an intolerable burden to the landowners consequent upon the material depreciation in the values of produce, so that a large percentage of

* Abstract from the Report of the Governor-General of the Philippine Islands 1932-33.

this tax remained unpaid and it was evident that it was physically impossible for them to meet their normal payments. In the circumstances, enforcement of payment was out of the question and it was decided that payments should be adjusted to the ability to pay and towards this end a far-reaching campaign for collection was instituted with remarkable success. In this connexion, a reassessment of land values was urged to adjust them to present productive values and all provinces were pressed to reorganise and reduce their government expenses to conform with decreased revenues.

A law was passed which, *inter alia,* authorised provincial treasures to prescribe and publish periods specially fixed for the collection of taxes to suit the seasonal differences which affected the harvesting dates of the various crops found in the Islands and to make collections in semi-annual instalments.

In addition, this law empowered municipal councils to levy special assessment against any property to which special benefits accrued as a result of public works.

The Report draws attention to the importance of the small farmer in the Philippines and the necessity for his assistance in any possible way. Towards this end, efforts are being made to promote diversification of crops, to encourage poultry and pig-raising, and the growing of vegetables for home consumption. On the other hand, increases should be envisaged in the tariffs on such articles as can and should be produced on the small farms, provision should be made for the reassessment of land values, to render reasonable credit easy and to curb usury. Assistance should firstly be given to small farmers already settled on the land and every effort should be made to encourage further settlement of small-holders.

This is being achieved by amplification and development of agricultural extension work to the limits of the means available, including lectures, demonstration caravans, model houses and agricultural fairs which encourage competition and in which demonstrations of improved varieties of plants or implements are useful towards broadening the scope of agriculture.

In the fairs, social aspects are stressed and amusements are provided while all prizes are of a practical nature—such as a plough, or a couple of pigs—which are appreciated by the small farmer more than the certificate which is commonly bestowed; free seeds for crops especially adapted to localities are also distributed at fairs and from caravans. Usury is rigorously opposed, not only by the extension of credit on reasonable terms, but by the punishment of usurers.

The Philippine National Bank aims at the extension of credit of the small farmer by granting loans up to P.500 secured by standing crops, or by mortgage of real estate. It also envisages the formation of rural credit societies and the organisation of rural banks. The tenant farmer in the rice-growing areas is protected by a law which provides for written contracts between landlord and

tenant in a dialect known to both, which constitutes a notable advance against one of the most potent abuses in regions where payment is in kind rather than in money.

With a view to increasing the number of small farmers, systematic effort is directed towards the survey of suitable large tracts of land, towards dissemination of information regarding such areas in the regions where land hunger is most patent, and towards the prevention of land speculation by earmarking all public lands contiguous to projected highways for occupation by small-holders only.

Furthermore, the curriculum of the agricultural schools is being remodelled so that the last few years of study will be upon farms, and large tracts of land are being exclusively reserved for demarcation of homesteads for graduates. It is intended that each class will go as a colony to a selected district and settle there, a resident teacher being responsible for the instruction of the boys while they are developing and improving land which will become their own property on graduation.

Although the agricultural population forms the main section of the people, the needs of industrial workers are also to be borne in mind, especially as this class of the community is steadily increasing in number. For this class, laws have been passed regulating the operation of private employment agencies, binding contractors to guarantee the payment of labourers, freeing labourers of any compulsion to purchase food, raiment or any other commodities by any tokens other than local legal tender currency and forbidding the payment of wages except in such currency.

Other laws permit municipal authorities to make free distribution of medicines to labourers under their jurisdiction, to give preferential claims to wage earners, to allow free medical tratment to labourers in establishments where over 30 are employed, to provide for preferential claims to such classes as labourers and domestic servants in cases of insolvency and to make provision for mediation and arbitration between landlords and tenants and between employers and employees.

The Philippines abound in natural resources, the population is intelligent and industrious yet economic development has been faulty in three directions.

Firstly, many agricultural products which can be grown or produced in the Islands are imported, such as pork, coffee, tobacco, fish, eggs, onions, cotton beans and cocoa, the total value of these imports totalling some P. 40,000,000.

Secondly, though raw materials and skilled artisans are numerous, little or no manufacture is in progress whereas commodities such as cotton goods, soap, starch and sacking are imported annually in large quantities.

Thirdly, there is little flexibility of mind so that paths beaten in the past are still closely followed despite changed conditions. Rice cultivation, for instance, only occupies the land for half the year, whereas much rice land could

be used throughout the year by diversification of crops which would materially increase the farmer's annual income as well as supply products for his own consumption.

Towards improving existing conditions the tariff rates, which had altered very little since 1909 despite highly changed times, were investigated and the need for increases became evident, the demand for increased tariffs coming equally from producers, exporters and American manufacturers.

Accordingly, the Legislature amended the general customs policy so that foreign invoice values should be converted into Philippine currency in assessing *ad valorem* duties so as to prevent dumping of foreign goods and in order to dispense with the limit of 100 per cent. in *ad valorem* duties.

In addition, measures were enacted to effect specific upward revision of the tariffs in regard to meat, peanut oil, eggs, footwear and some 70 other products, while tariffs on textiles, steel, wheat flour and motor car tyres were eliminated.

The economic situation in the Philippines appears sound superficially, but its high dependence on the sugar trade with the United States (to which it exported P. 122,000,000 worth of sugar and sugar products in 1932) renders it precarious. This position is aggravated by the possibility of the islands becoming an independent nation and thus losing the advantage of free trade with the United States, since economically, sugar production in the Philippines cannot compare with Java where already over-production exists to the extent of 4,000,000 tons. Thus, it becomes increasingly evident that the islands must devote immediate attention to diversifying products and to developing new markets, especially in China. In endeavours to broaden the base of the economic structure of the Philippines, careful attention is directed towards developing existing industries and creating new ones indicated by undeveloped natural resources or special aptitude on the part of the people, such as is shown by the fishing industry, in regard to which special administration is being established in order to foster it from every aspect.

Similarly, the Manila hemp industry is suffering from competition and low prices and efforts are to be made to find new markets and, if feasible, to utilise the material in manufacture of sacking and other products within the country. Although the natural resources of the country are abundant, they are not inexhaustible and efforts are to be directed against waste and towards the full development of the resources at hand, such as is manifested in the homestead policy under which small rather than large farms are advocated. In like fashion, all water power is declared as part of the public domain and measures have been taken to prohibit the use of poison and dynamite in fishing in the furtherance of conservation of resources.

With regard to education, while much progress has been achieved in the past 30 years, it has been a failure in that ever increasing numbers of youths

have been trained for clerical positions which do not now exist, with the result that graduates have become liabilities rather than assets on the State.

Accordingly, every effort must be made to render school curricula practical so that the young may become capable of maintaining the agriculture and other industries of the country.

It is hoped that this end will be achieved by community assemblies held monthly for adults in the schools and that the local teacher or some Departmental Officer should lecture at each assembly.

A large number of practical lectures is being prepared and translated into the ten Philippine dialects for distribution through the teachers.

The lectures embrace all kinds of subjects and are couched in simple terms, understandable to all, and often accompanied by diagrams or models, while a question period is specified at each assembly.

[The drastic changes in the economic life of the people, the national economic situation and the efforts being made to meet the demands of the times in the Philippines, form a striking analogy with present conditions in Malaya where the people are now being educated to tariffs, particularly on imported foodstuffs which could be grown within the country and where the importance of the peasantry is now being stressed by propaganda work, land settlement, and better methods of manufacturing and marketing their produce while every opportunity for fostering existing industries and initiating new ones is being taken.—*H.W.J.*]

Reviews.

Cooperation in the Hawaiian Pineapple Business.

By Royal N. Chapman. American Council Institute of Pacific Relations, New York 1933. 15 pp.

This pamphlet describes the history and development of co-operation among the pineapple producers of Hawaii.

The Hawaiian canned pineapple industry, which has been in existence for less than forty years, is now controlled and operated by a small group who are both growers and canners, and who produce roughly eighty-five per cent. of the world's supply of this product.

The reader is reminded that of a total world consumption of about fourteen and a half million cases of canned pineapples, Hawaiian production is over twelve and a half million cases and Malaya over one and a half million. The other exporting countries are Formosa, South Africa and Queensland.

Although co-operation in the Hawaiian industry has now been developed to a high state of efficiency, it is pointed out that this result has not been easily brought about. On the contrary, it has been embraced only when the alternative has seemed to be leading to serious financial loss.

Co-operation amongst those engaged in the production of Hawaiian canned pineapples has varied from time to time and includes advertising; the support of research work in connection with the growing, improvement and protection of pineapples; the allotment of space on boats; and, in cooperation with the Hawaiian Sugar Planters' Association, the importation of labour.

The idea of co-operation was first mooted in 1904 and concrete proposals made in the following year. The industry at that time, however, could come to no agreement on the subject. Such co-operation as was proposed would, it is claimed, have prevented the excessive canning capacity which now exists, thus resulting in a great saving of capital; it would also have resulted in a standardization of the product. The fact that one company controlled forty-seven per cent. of the pack and was not interested in the co-operative proposals militated against the adoption of the plans for co-operation.

The advantage of co-operative advertising has twice been demonstrated in the history of the Hawaiian pineapple industry. In both cases, be it noted, the scheme has been forced on the packers by the economic conditions.

Early in 1909, the industry found itself with about seventy per cent. of the entire pack of the previous year still on hand. Faced with this position and with the low price of pineapples, the industry united and with the sum of $50,000 (gold) with which to finance a co-operative advertising campaign, succeeded in disposing of its pack by the middle of June of the same year.

A somewhat similar situation arose in 1912. In this instance the Association of Hawaiian Pineapple Packers was formed and a cess of five cents per

case on the year's pack was imposed to finance the advertising campaign. Assessments have been made more or less continuously from that time for the purpose of advertising.

The need for research work was first evinced in 1914 when the Pineapple Association arranged with the Hawaiian Sugar Planters' Association for a certain amount of work to be done on pineapple problems. In 1922 a further step was taken towards extending the pineapple research work by the lease of 100 acres of land for experimental purposes. Two years later, the research work was withdrawn from the Experiment Station of the Hawaiian Sugar Planters' Association and organised by the University of Hawaii with the support of an assessment on the pack of pineapples—which amounted to a little over one cent a case on the pack. The budget for the work in that year was $96,537; in 1933 the sum of $161,818 was estimated for this work.

The incentive for the development of the research work is stated in the following words:—

> " It is interesting that the initiation of the work with the H.S.P.A. in 1914, the leasing of one hundred acres at Wahiawa for experiment work at the end of 1922, and the setting up of the independent research work at the University of Hawaii from 1924 to 1926 coincided with the three reductions in pack increase in the history of the industry.* It was economic necessity rather than any logical plan or forethought that brought about these three important steps in the history of the industry's cooperative activities."

The establishment of the Experimental Station led to a very much larger potential production of pineapples owing to the introduction of the method of mass planting, whereby the number of plants per acre was increased from a range of 8,000 to 10,000 to one of 12,000 to 20,000, with a corresponding increase in the yield of fruit; and to an expansion into the drier areas following upon a demonstration of the ability of the pineapple to grow under conditions of low rainfall.

Co-operation with the object of obtaining better shipping facilities is a further instance of necessity compelling co-operation. A situation of difficulty arose in 1917 in which, owing to the Great War, the industry was unable to obtain sufficient material for putting up the pack of pineapples. Eventually the packers, in co-operation with shipping companies, effected arrangements whereby they were assured of the supply of all necessary materials to Hawaii and for the transport of the pineapples to the Coast.

The history of how the Hawaiian canned pineapple industry has fared in the present world depression is given in some detail. The acreage under pineapples rapidly increased between 1928 and 1930 and the satisfactory means of controlling wilt, which was announced at about this time, greatly increased the estimated pack in the coming years. The position became so serious that in September 1930 most of the packers agreed to stop short of the end of the season. Consequently, the pack was less than the 13,000,000 cases for which there was fruit in the field. The estimated pack for the following year was

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* The reduction in packs on these three occasions are ascribed respectively to wilt, the withdrawal from one area because the production of pineapples there was no longer possible, and pineapple yellow spot.

16,000,000 cases. "With a world depression in full force, and the carryover at the beginning of 1931 equal to sixty-one per cent. of the pack of the year before, the Hawaiian pineapple industry was again faced with conditions similar to those experienced in 1907 to 1909".

In the face of economic depression and with the increased pack, advertising failed to maintain sales; the price of pineapples was cut to below cost of production in spite of which the situation became worse.

It became evident that once again the industry must unite to save itself. Seven pineapples companies were involved and negotiations ensued having for their object an agreement for the reduction of the pack. It was agreed that at least for a period of years the Hawaiian pack should not exceed 10,000,000 cases per annum. A new body—The Pineapple Producers' Cooperative Association—was formed and an advertising campaign organised to spend a million dollars, the cost to be met by an assessment on a basis. It is too early to judge the degree of success of this Association. It is attempting at present, to pool the pineapples as canned and to market them co-operatively.

The pamphlet refers to the situation in the Malayan industry and the need of closer co-operation of canners in order that the industry may be reorganised and established on a sounder basis.

Assuming that such co-operation in the Malayan industry materialises, the author visualises "the formation of an international trade agreement whereby potential sales areas of the world would be allocated, as has been done with certain other industries, thus eliminating competition between co-operatives."

The problems that have arisen in the Hawaiian industry are parallel with those met with in Malaya. The difference is that Hawaii appears to have gone a long way along the road which leads to a permanent solution of the most difficult problems which time and again confront the industry, and which are common to both Hawaii and Malaya. The latter country, therefore, will lose nothing by a very close study of the Hawaiian experience and the manner in which that country hopes to solve its difficulties.

D. H. G.

The West Indian Fruit and Vegetable Industries.

In recent years, considerable developments have taken place in the transport and marketing of fresh fruits. It has been rendered possible primarily by the advance in knowledge of the most suitable temperature conditions at which particular fruits should be maintained during transit. These investigations, undertaken by various low-temperature stations and assisted by the interested co-operation of transport companies—by land and sea—have provided the fruit growers with a wider market. The consumer is now offered a very much wider range of fruits than formerly and in better condition. Furthermore,

the consumer finds that whereas formerly his favourite fruit was procurable for but a short season, nowadays the seasons are lengthened, while many fruits are now procurable throughout the year.

The development of markets has necessitated new series of investigations in many directions. The grading of fruit is no longer sufficient; research is now concerned with the behaviour of varieties of fruit in storage, desirable qualities of fruit from the point of view of packing, ripening quality of fruit and the study of the market with the object of distributing production to ensure continuity of supplies.

This subject and the problems connected with it, is again brought to the fore by the recent publication of the Report, Recommendations and Proceedings of the West Indian Inter-Colonial Fruit and Vegetable Conference, Jamaica, 1933.

Its recommendations, which are succinct, adequately cover the various aspects of the subject. Allusion may be made to certain of these recommendations which may be of particular interest locally.

With regard to limes and lemons; in view of the fact that the lime industry has lost its market for citric acid and to a certain extent, for raw juice and that the demand for its essential oil and fresh fruit is restricted, it is recommended that each Government should discourage further planting. Also growers should be advised of the present position and the desirability of restriction in the interests of the industry. The lemon industry is also overstocked, and producers should be advised accordingly.

Regarding pineapples, the recommendations are stated as follows:—

> "There does not appear to be any immediate possibility of reviving the former export industry in fresh pineapples from the West Indies, but market demands would appear to warrant trial shipments to the United Kingdom and Canada, on a small scale under the supervision of the Department of Agriculture. Suitability of the different varieties to the export trade also requires investigation.
>
> "Caution appears necessary in any consideration of extension of planting on a commercial sale, either for the export of fresh fruit as for production for canning.
>
> "The existing supplies of the canned product are greatly in excess of market requirements, and this condition may be expected to continue for some time. The results of the recently established cannery in British Guiana should be awaited before further commercial canneries are considered in any other West Indian Colony."

An interesting recommendation is that a clearing-house be established for the collection, co-ordination and circulation of information gathered on the various aspects of production and marketing of fruit and vegetables of the West Indies. Bearing on the same subject, it is suggested that Government Departments of Agriculture or Government Marketing Agencies should be responsible for investigation and marketing trials on crops for which an export

market appears to exist and that a Marketing Intelligence Officer for the West Indies Colonies should be appointed to work in Canada. By this appointment the Colonies would be able to maintain direct contact with their markets.

Two West Indian Fruit and Vegetable Councils are advocated with the object of co-ordinating the production and marking of fruits and vegetables from the various Colonies. They would be in close touch with the producers on the one hand and with the markets on the other hand.

The value of advertising is recognised and the suggestion is made that the sum of £2,000 per annum be raised by imposing a cess on produce to be paid by the growers.

Standardization of products is insisted upon by means of grading, packing and marking. The Report states —

"It is essential to the development and success of the Fruit and Vegetable industries in the West Indian Colonies that only high grade products should be exported, that only varieties approved by competent advisers should be grown and that the products exported should be as uniform as possible in respect of quality, grading, packing and marking."

"These objects can best be achieved by preventing by Law the export of products below recognised market standards."

D. H. G.

The Butterflies of the Malay Peninsula.

By A. S. Corbet and H. M. Pendlebury. 252 pp. Illustrated. Published by Kyle Palmer & Co., Ltd., Kuala Lumpur 1934. $4.50.

The publication of this reasonably priced and non-technical book has filled a long felt want for those who are interested in the butterfly fauna of the Malay Peninsula.

Experienced Lepidopterists, and also those who are sometimes rather uncharitably termed "mere collectors" will be assisted in their work, in no small degree, if advantage is taken of this volume, which comprises, in addition to well drawn up descriptions of some eight hundred species, chapters on the structure, characteristics, life histories, classification, geographical distribution, methods of capture and preservation, on mimetic resemblance, heredity and on the bibliography.

The book is illustrated by two coloured plates, thirty-four text figures, fourteen photographic plates shewing two hundred and thirteen species, ond by two maps.

In view of the fact that most works on tropical butterflies are expensive and therefore not within the means of many people, the publication of this useful volume is welcomed and the authors are to be congratulated on their achievement.

N. C. E. M.

Departmental.

FROM THE DISTRICTS.

The Weather.

Weather conditions varied considerably in different parts of the Peninsula. In Kedah, Penang, Province Wellesley and north west Krian, they were warm and dry with occasional showers. In Perak, heavy showers and high winds resulted in a rainfall above average in most Districts. In Pahang and Selangor, warm dry weather was interrupted by fairly frequent thunderstorms and high winds. In Negri Sembilan, Malacca and Johore, warm dry weather prevailed. In Kelantan and in Singapore Island, the first half of the month was cool and showery, while the second half was warm and dry.

Remarks on Crops.

Rubber.—There was a further rise in the average price of rubber during the month. The highest and lowest prices in dollars and cents per picul recorded for rubber from small holdings were:—Smoked Sheet $14.00 to $22.00; Unsmoked Sheet $11.00 to $20.50; Scrap $3.50 to $9.50. The average Singapore prices for these grades were respectively $20, $18.50 and $8.50 as compared with $19.00, $17.50 and $6.00 in January. Penang prices for Unsmoked Sheet ranged from $15.00 to $20.50 as compared with $13.50 to $16.50 in January.

Wintering was general throughout the month with the usual resultant lower yield of rubber. This factor and the enhanced price of rubber led to more severe tapping and to further extension of the tapped area. For example, a number of holdings in Kedah were observed to be tapped twice daily; in Penang Island the trees were tapped in the early morning by lamp-light; while in Johore, tapping was commenced on a considerable area of holdings containing young rubber trees which had never previously been tapped.

With the rise in price, neglected holdings were cleared and weeded and approved disinfectants were used more freely for the treatment of mouldy rot disease, which also received a check from the dryer weather conditions. Leaf mildew (*Oidium heveae*) was not in evidence, being reported from only one estate in the Negri Sembilan.

In Pahang, attempts to persuade the small-holders to combine and sell their rubber in bulk have begun to meet with success and to result in better prices. A movement is on foot to produce a better quality of smoked sheet by the use of smoke houses worked on a co-operative basis.

In Kelantan, a marked advance was made in the improvement of small-holders' rubber. The original small factory at Pulai Chondong is now used by 54 people and 6 other such factories are being erected on other localities. The sheet prepared sold for $17 per picul, while the wet and dirty lump rubber usually made in this State only realised $9 per picul.

Padi.—The price of padi at the Government Rice Mill, Bagan Serai, was reduced to $1.40 per picul, the roadside price in Krian District being $1.20 per picul. In Kedah and Province Wellesley, the price was even lower, being approximately 95 cents to $1.20 per picul. In other parts of the country, the price ranged from 5 to 12 cents per gantang in the villages, thus showing little change from that obtaining in January.

In Kedah and Malacca, the padi harvest was nearing completion at the end of the month. In the former, yields were on the whole very good and in the latter fairly good. In the Negri Sembilan, the harvest was finished except in Kuala Pilah District. Work was well advanced in Province Wellesley where good crops were recorded. In Krian, in spite of the handicaps of labour shortage and wet weather in the southern areas, good progress was made and an excellent crop was expected. Mention is made of yields varying from 600 to 750 gantangs per acre from certain long-term strains of padi, such as Seraup 36 and 48, in the best deep soil areas. Elsewhere in Perak, harvest was in progress. In Kelantan, a good crop of dry padi was reaped, but harvesting of the rather poor wet padi crop had not commenced.

The pure strain padi have proved their value in several localities. In Kedah, in view of the large supplies of these strains now available and of the excellent results so far obtained by owners who have planted them, a campaign for the wide-spread distribution of the seed is being undertaken. In several localities in Pahang these strains have proved considerably superior to the local varieties of padi, while in northern Johore there has been a spontaneous demand for pure strains from cultivators, which has led to the supply of 531 gantangs of seed from the Pulau Gadong Station in Malacca.

In Northern and Central Johore, the work of preparation for the coming season's crop is commencing and uniform dates for the various operations have been arranged.

Coconuts and Copra.—The price of copra from small holdings remained very low, being $2.30 per picul in Singapore and $2.60 to $2.80 in Penang. Elsewhere it varied according to quality from $1.30 to $2.90 per picul, except that in one locality in Kedah a price as high as $4 per picul was recorded.

In most copra-producing areas, nut prices were correspondingly low, except in the coastal Districts of Selangor, parts of the west coast of Johore and the District of Temerloh in Pahang, where a temporary shortage of nuts, or competition between Malay and Chinese copra makers, or these two factors combined, resulted in a higher price for nuts, which in some cases was such that copra could only be made from them at a loss. Nut prices in Malacca rose slightly owing to considerable exports to the Negri Sembilan.

Padi harvest has somewhat suspended improved copra production and the erection of new kilns in Province Wellesley and Krian, but interest has been maintained and arrangements have been made to commence work as soon as the harvest is finished. In Lower Perak and Johore, progress has been made.

In the latter State, work on the construction of several kilns in Muar and Batu Pahat Districts was commenced and marketing channels received attention.

It is in such difficult times as are now being experienced that the small increase in income obtainable from the preparation of good copra, as compared with that obtainable from the sale of nuts, is of the most importance to owners of coconut holdings, since it may just make the difference between a sufficient and an insufficient supply of food.

Pineapples.—Activity in the pineapple industry increased during the month, but fruit supplies in Singapore were limited so that the three factories operating produced but a small output. In Johore, six factories were working daily, except for five days of the Chinese New Year holiday. Prices for fruits in Singapore were, first quality $3.20, second quality $1.80 per hundred; corresponding prices in Johore ranged from $2.40 to $3.60 and from $1.80 to $2.60.

A scheme for selection of pineapples, with a view to improving the type of fruit, was drawn up and work in accordance with this scheme was commenced both on the Pineapple Experiment Station and on privately-owned pineapple areas in Singapore Island.

Fruit.—In Krian, Malacca and Johore, mango trees were flowering well, while in the latter State a few duku trees were fruiting. In Penang Island, there was a good trade in water-melons, especially during the Chinese New Year, prices realised being 10 to 15 cents each. In Malacca, where the cultivation of this fruit by Malays was extending, the fruit were realising 25 to 40 cents each.

Vegetables.—In Malacca, vegetables grown on padi land cropped with short-term varieties were beginning to find their way into the market. Chillies were being produced in excess of requirements; the balance were sundried and mixed with imported chillies, the price for which has recently shown a rise. Damage to market gardens in Johore by floods during January caused a shortage of supplies of vegetables in that State, while in Singapore Island gardeners in areas which were not damaged by floods during January have benefitted considerably from the rise in price due to reduction of supplies. In Kedah, tomato planting by Malays for sale at the Weekly Fairs was noted in Baling District. In the dry season and in situations near a supply of water, tomato-growing is expected to develop into a successful minor industry in this State.

Tobacco.—Prices for sundried tobacco leaves ranged from $14 to $35 per picul for first quality, except in parts of Johore where prices as high as $60 per picul were obtained. In Kedah, about 26 acres of tobacco were planted. In Province Wellesley and Pahang, low prices have reduced interest in this crop, although some 21 piculs of cured leaf were sold in the Province. In Singapore Island, however, interest continues with a price of $35 per picul for cured leaf.

Coffee.—Prices for locally grown Liberian and Robusta coffee have varied from $13 to $28 per picul, the highest prices being obtained in Kedah. Interest

in coffee cultivation is extending in Pahang, where supplies of seedlings for sale are being maintained at the Agricultural Stations. In Segamat District of Johore, areas of land have recently been alienated to Chinese for the cultivation of coffee as a sole crop.

Agricultural Stations.

Trials of the vegetative propagation of a number of different fruit trees by means of the etiolation method * are being conducted at several of the Agricultural Stations. Rooted shoots of rambutan and Jack fruit were obtained by this method at Bukit Mertajam Station and rooted shoots of rambutan and pulasan at the Pineapple Experiment Station, Singapore. At the latter, grafts of mango, pulasan, rambutan and avocado pear were obtained by approach grafting.

At Bukit Mertajam Station, experiments with groundnuts showed that yields from rows which received a dressing of lime at the rate of 1 ton per acre in addition to cattle manure gave approximately twice the yield obtained from the rows that received the same quantity of cattle manure alone. This result supports previous experiments on Castleton Estate in 1916.†

The imported fowls at the Government Experiment Station, Tanah Rata, continued to lay well. The number of eggs obtained varied according to breed from an average of 16 to an average of 22 per pullet for the month. Of these 53 per cent. were over 2 ozs. each in weight and 47 per cent. were between 1½ and 2 ozs. each.

Padi Test Plots.

Harvest was completed at Titi Serong Padi Station and on all Test and Multiplication Plots in Krian, except the Briah Test Plot. Yields were good. Seraup 36 and 48 and Siam 76 were outstanding at the Kuala Kurau Plot. At the Temerloh Plot in Pahang, Nachin 27 doubled its yield as compared with last year's crop, but for some reason F.S. 875 showed a much decreased yield of 448 as compared with 560 gantangs per acre in the previous season. At the Rembau Plot in the Negri Sembilan, some of the pure strains ripened very unevenly, each variety having a maturation period varying by some 50 days, thus Nachin 66 gave a period of 238—291 days and Seraup 48 272—322 days. At the Pulau Gadong Station in Malacca, some selections of Padi Milek from Pahang gave very promising yields which were as good as, or better than, the local Nachin and Siam selections, while the straw of the Milek strains was much stronger.

At Dong Test Plot in Pahang, plots of short-season varieties of padi have been planted to test the possibility of obtaining two crops in a year. At Pulau Gadong Station, one acre was planted for the same purpose with the short-term padi Radin Siak.

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* *Malayan Agricultural Journal,* February, 1934, page 58.

† *Malayan Agricultural Bulletin,* Vol. IV, page 376.

Beds of padi straw for the cultivation of the mushroom, *Volvaria volvaceae*, were established at Telok Chengai, Rembau, Pulau Gadong and Sungei Udang Stations with spawn from Bukit Merah Station. A bed in the office compound in Kedah started to produce mushrooms 26 days after the spawn was built into it.

Rural Lecture Caravan.

The Caravan visited Lower Perak from February 5th. to 18th. when lectures and demonstrations on the production of improved copra were given. Audiences evinced much interest in the display of models of kilns and samples of copra illustrating the effect of various faults in harvesting and preparation.

From February 20th. to 28th. a visit was paid to Sabak Bernam sub-District, the subjects dealt with being copra production, padi cultivation and rat control in padi fields.

Copra Course.

A course of instruction on the erection of improved copra kilns and the preparation and marketing of improved copra was given at the Coconut Experiment Station Klang to 13 Malay Agricultural Officers and Headmen from Kelantan, Pahang, Malacca, Province Wellesley and Singapore from February 20th. to 3rd. All those attending exhibited a lively interest in the information given.

Malayan Padi Competition.

Judging of entries at six local padi shows in the Alor Gajah District of Malacca was carried out during the month in accordance with the new scheme for the Malayan Padi Competition described in the *Malayan Agricultural Journal* for December, 1933, page 682.

DEPARTMENTAL NOTES.

Appointment to Federal Council.

With the approval of His Majesty the King, His Excellency the High Commissioner has been pleased to appoint the Director of Agriculture, Straits Settlements and Federated Malay States, to be a member of the Federal Council with effect from the 8th. January, 1934, inclusive.

Tours and Visits of the Director.

The Director of Agriculture visited Singapore on February 14th. and 15th. for the purpose of attending two emergency meetings prior to the departure of His Excellency the Governor. He also inspected the Pineapple Station at Lim Chu Kang.

On February 16th. he proceeded to Pahang and met the British Resident, Pahang, at Temerloh for the purpose of discussing questions in connection with the proposed Government rice mill at that point.

Subsequently, he toured the State of Pahang and inspected all official agricultural undertakings and discussed departmental questions with the State Agricultural Officer and other officers. He returned to Kuala Lumpur on February 26th.

Advisory Committee for the School of Agriculture.

A meeting of the Advisory Committee for the School of Agriculture, Malaya, was held on February 8th.

It was agreed that the fees of students domiciled outside the Straits Settlements and Federated Malay States be fixed at $420 per annum for the Two Years Course and $210 for the One Year Course.

The Straits Settlements and the Federated Malay States Governments have offered a number of Major and Minor Agricultural Scholarships for each year, the precise number of which will be determined from year to year. Six scholarships of each grade were awarded for the F.M.S. in 1933 and the same number is offered this year, as against three of each for the Colony. The latter scholarships are not confined to Malays.

The Chairman stated that the number of applications for admission to the School next May, particularly as Private Students, was already extremely satisfactory. The proportion of Chinese amongst present candidates is large.

The Committee expressed its satisfaction with the School's progress during the past year, and with its immediate prospects.

Leave.

Mr. T. D. Marsh, Assistant Agriculturist. has been granted full-pay leave for 8 months and 8 days with effect from 17th. February, 1934.

Statistical.

MARKET PRICES.

February 1934.

Rubber.—The market price of rubber has remained steady during the month, opening at 16 cents per lb. for Spot loose in Singapore and closing at 16⅛ cents per lb. The average price for the month was 16¼ cents per lb. in Singapore, 4⅞ pence in London and 10¼ cents Gold in New York, as compared with 14½ cents, 4 13/32 pence and 9⅛ cents Gold respectively in January.

Weekly prices during February for small-holders' rubber at Kuala Pilah, Negri Sembilan; Kuala Kangsar, Perak, and Batu Pahat, Johore, were as shewn in the following table:—

	VALUE PER PICUL (dollars)									
Grades	Kuala Pilah, Negri Sembilan.		Kuala Kangsar, Perak.				Batu Pahat, Johore.			
	15.2.34	22.2.34	31.1.34	14.2.34	21.2.34	28.2.34	7.2.34	12.2.34	21.2.34	28.2.34
Rubber *	17.00	17.26	17.98	18.49	17.23	18.52	16.48	18.75	19.11	19.60
Scrap		5.00								

Palm Oil.—The course of the market Liverpool/Continent during February on a basis of 5 per cent. f.f.a., c.i.f. was as follows:—February 7th. £14.10.0 per ton net, February 21st. £14.10.0 per ton net, and February 28th. £14.15.0 per ton net.

Prices in the U.S.A. landed weight per pound in bulk c.i.f. New York/Philadelphia were 2.62 cents Gold on the 7th. February, 2.60 cents Gold on the 21st. February, and 2.75 cents Gold on the 28th. February.

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* Wet unsmoked sheet.

Transport by lorry Kuala Pilah to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

The price of palm kernels Fair Average Malayan Quality c.i.f. landed weight on the Continent was shillings 7/3 per cwt. on February 7th., shillings 7/3 per cwt. on February 21st., and shillings 7/1½ per cwt. on February 28th.

Copra.—The price of copra remained steady during February. The highest Singapore price for Sundried during the month was $3.05 per picul, and the lowest price $2.95 per picul, the average price per picul being $3 as compared with $2.94 during January. The mixed quality averaged $2.40 per picul as compared with $2.29 in January.

Coffee.—The price at Singapore for Sourabaya coffee increased considerably; prices ranged according to grade, from $18.50 to $21.50. Palembang coffee averaged $17.19 per picul during the month, being quoted at $16.50 on the 1st. and $18 on the 23rd; the average figure for January was $13.12.

Arecanuts.—Palembangs averaged $3.73 per picul as compared with $2.92 in January, the rise in price being once again very considerable. The range of Singapore prices for other grades was Red Whole $3.50 to $5.50 per picul and Sliced $8 to $12 per picul.

There were no stocks of Bila Whole, Splits or Kelantan.

Rice.—The average wholesale price of Siam No. 2 ordinary rice per picul in Singapore in January 1934 was $2.91, as compared with $3.18 in December 1933; the average price for the year 1933 was $3.53. No. 1 Rangoon rice averaged $2.72 per picul in January, as compared with $3.11 in December 1933 and $3.04 for the year 1933. Saigon No. 1 (long grain) averaged $2.65 per picul. The average price of this rice in the year 1933 was $3.32 per picul.

Tea.—During January, the average price quoted in London for Malayan tea was shillings 1/2.74. Average prices during January for tea consignments from other countries were as follows:—Ceylon shillings 1/3.97; Java, shillings 1/0.23; Indian Northern, shillings 1/2.89 and Indian Southern, shillings 1/2.67.

Gambier.—The price of Block gambier remained steady during February, averaging $3.88 per picul, Cube No. 1 averaged $6.38. Corresponding figures for January were $3.85 and $6.35 respectively.

Pineapples.—There was a further slight increase in value during February, the average Singapore price per case being as follows:—Cubes $3.24, Sliced Flat $3.06 and Sliced Tall $3.19, as compared with $3.17, $3.05 and $3.13 respectively during January.

Tapioca.—The price of Flake Fair averaged $5.11 per picul as compared with $4.85 in January. Pearl Seed averaged $5.88 per picul and Pearl Medium $6.38 per picul, both slight increases on the average prices in January, namely, $5.60 and $6 respectively.

Sago.—Pearl-Small Fair decreased slightly in price during February, averaging $3.76 per picul for the month; the average price was $3.94 in January. Flour-Sarawak Fair averaged $1.95 per picul as compared with the January average of $1.92 per picul.

Mace.—Prices were nominal during February, the average for the month for Siouw being $65 per picul and $40 for Amboina.

Nutmegs.—110's averaged in price during February $21.25 per picul, as compared with $20 per picul in January; 80's increased slightly in value, averaging $24.25 per picul against the figure of $23.60 per picul in January.

Pepper.—Average Singapore prices during February were as follows:—Singapore Black $15.50 per picul; Singapore White $29.12 per picul and Muntok White $30.50 per picul; the corresponding figures for January were $15.30, $30.50 and $32.60 per picul respectively.

Cloves.—Prices continued steady and nominal as in the previous month; Zanzibar averaged $35 per picul, and Amboina $45 per picul.

Tuba Root.—Roots evaluated on the basis of ether extract averaged $25 per picul in the month, whilst good rotenon-containing roots averaged $30.50 per picul, being a similar average price to that of January.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co., Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Mackay & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY.*

January 1934.

Malaya.—The gross imports of rice into Malaya during January 1934 amounted to 45,510 tons, as compared with 48,972 tons in January 1933, while exports were 10,655 tons in January of this year as against 14,120 tons in January 1933.

Of the imports during January 1934, 61 per cent. were consigned to Singapore, 10 per cent. to Penang, 6 per cent. to Malacca, 22 per cent. to the Federated Malay States and 1 per cent. to the Unfederated Malay States. Of the total imports, 72 per cent. were from Siam, 20 per cent. from Burma, 7 per cent. from Indo-China and 1 per cent. from other countries.

Of the total exports during January, 77 per cent. were shipped to Netherlands India and 23 per cent. to other countries. The various kinds of rice exported were as follows:—Siam rice 6,490 tons, (61 per cent.) Burma rice 3,398 tons, (32 per cent.) Indo-China rice 536 tons, (5 per cent.) Indian rice (parboiled) 39 tons and local production 192 tons (2 per cent.).

Net imports of rice into Malaya in January 1934 were 34,855 tons as compared with 34,852 tons in January 1933.

India and Burma.—The total foreign exports of rice in December 1933 were 74,000 tons, and the total exports for the year 1933, 1,832,000 tons as compared with 2,075,000 tons in the previous year.

The final forecast of the rice crop in Burma for the season 1933—34, issued on February 15, 1934, gives the area likely to mature as 12,440,300 acres. The exportable surplus of the 1933—34 crop is still estimated at 4,324,000 tons of padi, which is equivalent to 3,200,000 tons of rice and rice products.

Japan.—Formosa. The area under padi (second crop) 1933 was 961,037 acres as compared with 941,108 acres in 1932; production was 620,350 tons in 1933 as compared with 663,000 tons in 1932.

French Indo-China.—Exports of padi into Cholon were 72,000 tons in January 1934, a similar figures to that for January 1933. Exports of rice in January 1934 were 95,000 tons, as against 74,000 tons in January 1933.

Netherlands India. (Java and Madura).—No further information to that published in the Summary for the month of December 1933, is available.

Ceylon.—Imports of rice for the year 1933 amounted to 439,893 tons as compared with 441,952 tons in 1932.

Of these imports, 18 per cent. were from British India, 72 per cent. from Burma, nil from the Straits Settlements and 10 per cent. from other countries.

Europe and America.—Quantities of rice shipped from the East were:—

(*a*) To Europe, 1,244,668 tons during the year 1933 as compared to 1,018,236 tons during 1932, an increase of 22 per cent. Of these shipments 46 (52) per cent. were from Burma, 2 (2) per cent. from Japan, 44 (38) per cent. from Saigon, 7 (5) per cent. from Siam, 1 (3) per cent. from Bengal; the figures for 1932 being in brackets.

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*Abridged from the Rice Summary for January 1934 compiled by the Department of Statistics, S.S. and F.M.S.

(*b*) To the Levant, (Jan. 1 to Dec. 18) 24,078 tons for 1933 and 49,437 tons in 1932, shewing a decrease in 1933 over the same period of previous year of 51 per cent.

(*c*) To the West Indies and America (Jan. 1 to Dec. 20) 165,452 tons in 1933, as compared with 126,277 ton in 1932, an increase in 1933 of 31 per cent. over the same period of previous year

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MALAYAN AGRICULTURAL EXPORTS JANUARY 1934.

PRODUCT.	Net Export in Tons.		
	Year 1933.	January 1933.	January 1934.
Arecanuts ...	20,756	2,407	3,612
Coconuts, fresh ...	100,609†	7,015†	6,515†
Coconut oil ...	17,568	1,618	1,763
Copra ...	110,543	14,584	9,263
Gambier, all kinds ...	2,560	181	173
Palm kernels ...	1,983	65	160
Palm oil ...	12,101	405	297
Pineapples canned ...	59,582	4,713	4,667
Rubber ...	459,836§	35,822§	41,773§
Sago,—flour ...	7,648	656	1,525
,, —pearl ...	2,646	129	255
,, —raw ...	4,420*	495*	464*
Tapioca,—flake ...	9,881	940	649
,, —flour ...	702*	315	184*
,, —pearl ...	17,297	1,056	1,099
Tuba root ...	569½	4	44½

† hundreds in number. * net imports. § production.

MALAYA RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING JANUARY, 1934.

State or Territory	Acreage of Tappable Rubber end 1932 (d)	Estates which have entirely ceased tapping		Estates which have partly ceased tapping		Area of Tappable Rubber never been tapped		Total (3) + (5)	Percentage of (9) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STRAITS SETTLEMENTS :—									
Province Wellesley	44,734	1,323	2.9	7,243	16.2	1,016	2.3	8,566	19.1
Dindings	6,,969	209	3.0	773	11.1	546	7.8	982	14.1
Malacca	111,780	4,619	4.1	15,944	14.3	6,393	5.7	20,563	18.4
Penang Island	1,635	365	22.3	77	4.7	180	11.0	442	27.0
Singapore Island	28,269	8,621	30.5	4,821	17.0	207	.7	13,442	47.5
Total S.S. ...	193,387	15,137	7.8	28,858	14.9	8,342	4.3	43,995	22.7
FEDERATED MALAY STATES :—									
Perak	250,951	3,954	1.6	27,919	11.1	14,679	5.8	31,873	12.7
Selangor	308,379	5,033	1.6	36,499	11.8	10,155	3.3	41,532	13.4
Negri Sembilan	228,541	4,763	2.1	20,065	8.7	14,172	6.2	24,828	10.8
Pahang	38,141	5,297	13.9	4,442	11.6	4,859	12.7	9,739	25.5
Total F.M.S. ...	826,012	19,047	2.3	88,925	10.7	43,865	5.3	107,972	13.0
UNFEDERATED MALAY STATES :—									
Johore	325.747	21,932	6.7	32,499	10.0	23,227	7.1	54,431	16.7
Kedah (a) (b)	114,551	3,595	3.1	9,556	8.3	(e) 5,700	5.0	13,151	11.4
Kelantan	21,175	5,749	27.1	2,200	10.4	1,860	8.8	7,949	37.5
Trengganu (c)	4,352	Nil	Nil	1,561	35.9	30	.7	1,561	35.9
Perlis (a) (b)	957	106	11.1	131	13.7	308	32.2	237	24.8
Total U.M.S. ...	466,782	31,382	6.7	45,947	9.9	31,125	6.7	77,329	16.6
TOTAL MALAYA ...	1,486,181	65,566	4.4	163,730	11.0	83,332	5.6	229,296	15.4

Notes :—(a) Registered companies only and are rendered quarterly.
(b) The figures quoted for Kedah and Perlis are those for end December 1933, revised figures will be published when available.
(c) Registered Companies only.
(d) Figures for end December 1933, are not yet available.
(e) Estimated: figures not yet available.

MALAYA RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF JANUARY 1934 IN DRY TONS.

Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
	Ports	Dealers	Estates of 100 acres and over	during the month	January 1934	during the month	January 1934	during the month: Foreign	during the month: From Malay States & Labuan	January 1934: Foreign	January 1934: From Malay States & Labuan	during the month: Foreign	during the month: Local	January 1934: Foreign	January 1934: Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States ...	...	12,715	12,728	12,341	12,341	9,763	9,763	Nil	Nil	Nil	Nil	14,447	8,509	14,447	8,509	...	12,267	12,309
Johore ...	...	3,305	3,182	3,244	3,244	4,563	4,563	Nil	6	Nil	6	1,810	6,104	1,810	6,104	...	3,362	3,024
Kedah ...	...	538	2,294	3,126	3,126	1,967	1,967	Nil	Nil	Nil	Nil	1,231	3,801	1,231	3,801	...	406	2,487
Perlis ...	...	28	15	21	21	34	34	Nil	Nil	Nil	Nil	Nil	65	Nil	65	...	24	9
Kelantan ...	...	215	203	190	190	935	935	108	Nil	108	Nil	54	1,009	54	1,009	...	393	195
Trengganu ...	...	55	50	200	200	99	99	Nil	Nil	Nil	Nil	Nil	299	Nil	299	...	55	50
Total Malay States	...	16,856	18,472	19,122	19,122	17,361	17,361	108	6	108	6	17,542	19,787	17,542	19,787	...	16,507	18,074
STRAITS SETTLEMENTS :-																		
Malacca ...	...	2,734	1,293	1,322	1,322			1		1		4,238		4,238		...	2,649	1,220
Province Wellesley	...	1,067	602	630	630			Nil		Nil						...	1,029	692
Dindings ...	...	59	154	115	115	3,047	3,047	Nil	19,908	Nil	19,908		Nil		Nil	...	70	139
Penang ...	2,354	5,465	8	20	20			1,935		1,935		8,133		8,133		2,939	6,536	13
Singapore ...	5,955	31,110	149	156	156			14,084		14,084		25,346		25,346		6,159	32,045	143
Total Straits Settlements	8,309	40,435	2,206	2,243	2,243	3,047	3,047	16,020	19,908	16,020	19,908	37,717	Nil	37,717	Nil	9,098	42,329	2,207
TOTAL MALAYA	8,309	57,291	20,678	21,365	21,365	20,408	20,408	16,128	19,914	16,128	19,914	55,259	19,787	55,259	19,787	9,098	58,836	20,281

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
20	21	22	23	24	25	26
DRY RUBBER	8,566	27,381	5,636	3,449	1,335	122
WET RUBBER	3,701	4,664	900	299	2,027	284
TOTAL ...	12,267	32,045	6,536	3,748	3,362	406

TABLE III
FOREIGN EXPORTS

PORTS	For month	January 1934
Singapore ...	36,726	36,726
Penang ...	12,186	12,186
Port Swettenham.	5,551	5,551
Malacca ...	796	796
MALAYA ...	55,259	55,259

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January 1934
Malay States ... / Straits Settlements	40,811	40,311
MALAYA ...	40,311	40,311

Notes :—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption. *i. e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + 22 tons local consumption during the month —[2]—[3]—[4]—[5]—[9]—[10]. For the Straits Settlements, Columns [9] and [10] represent purchases by dealers from local estates of less than 100 acres, reduced by 15 % to terms of dry rubber.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15; wet sheet, 25 ; scrap, lump, etc., 40 %; stocks elsewhere are in dry weights as reported by the dealers themselves.

4. Domestic exports are estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign exports of the later month, the foreign exports of the Malay States being domestic production.

5 The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 23rd February 1934.

Locality	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall									Bright Sunshine		
	Means of			Absolute Extremes						Total		Most in a day	Number of days								
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet			Amt.	Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Total	Daily Mean	Per cent
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.								
Railway Hill, Kuala Lumpur, Selangor ...	87.9	70.8	79.3	92	67	79	73	82.3	83.3	11.08	281.4	3.28	15	10	2	5		147.35	4.75	40
Bukit Jeram, Selangor ...	85.9	71.0	78.4	89	68	80	73	81.5	83.7	9.33	237.0	3.52	18	17	1			154.75	4.99	41
Sitiawan, Perak ...	86.9	70.6	78.7	92	63	80	74	82.0	83.3	11.62	295.2	2.86	19	18	3	4		174.00	5.61	48
Temerloh, Pahang ...	82.9	70.3	76.6	90	66	75	73	80.4	83.4	10.24	260.1	3.23	23	19		5		131.40	4.24	36
Kuala Lipis, Pahang ...	82.6	69.8	76.2	89	66	75	73	80.2	82.0	16.32	414.5	3.81	22	20		23		120.20	3.88	33
Kuala Pahang, Pahang ...	81.6	74.5	78.1	84	70	78	77	79.9	81.5	10.71	272.0	2.38	19	19				144.60	4.66	39
Mount Faber, Singapore ...	82.6	70.9	76.7	87	67	71	73	77.7	79.4	18.94	481.1	6.20	18	15		1		117.80	3.80	31
Butterworth, Province Wellesley ...	87.1	71.5	79.3	91	66	83	74	82.9	84.1	3.84	97.5	0.79	14	14	1	1		210.55	6.79	57
Bukit China, Malacca ...	83.4	72.1	77.7	87	70	77	74	78.9	80.9	8.06	204.7	1.53	18	15				119.85	3.87	32
Kluang, Johore ...	81.7	70.8	76.3	88	66	73	74	77.9	79.8	25.36	644.1	5.88	20	17		1	2	117.95	3.80	32
Bukit Lalang, Mersing, Johore	80.7	73.2	76.9	83	67	78	76	78.0	79.3	8.82	224.0	2.28	21	17				138.30	4.46	37
Alor Star, Kedah ...	87.6	69.8	78.7	91	62	83	73	81.9	83.9	2.94	74.7	1.36	6	4	2	1		208.55	6.73	55
Kota Bahru, Kelantan ...	83.0	71.4	77.2	85	62	80	76	80.1	82.0	3.46	87.9	0.47	21	17				174.25	5.62	48
Kuala Trengganu, Trengganu	82.3	72.0	77.1	85	63	80	76	79.0	80.6	5.34	135.7	1.53	18	13				132.95	4.29	36
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. Pahang ...	66.9	59.6	63.3	73	56	62	62	68.2	69.7	15.31	388.9	3.23	24	23		20		63.10	2.03	17
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	69.4	57.1	63.3	73	43	66	62	67.5	68.4	5.52	140.2	1.05	16	14			6	128.15	4.13	35
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	68.5	56.9	62.7	75	51	64	60			5.60	142.3	0.89	18	14			6	129.05	4.16	35

Compiled from Returns supplied by the Meteorological Branch, Malaya

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THE

Malayan Agricultural Journal.

APRIL, 1934.

EDITORIAL.

Agriculture in Trengganu.

The State of Trengganu, although the fourth largest of States in the Malay Peninsula, is probably the least known. Its geographical position has, no doubt, been partly responsible for the fact that development has proceeded at a much slower rate than it has in States more favourably situated. It contains, however, a very considerable population of Malays, and undoubtedly possesses great possibilities of development.

At the invitation of the State, Mr. J. A. Craig, Principal Agricultural Officer in the neighbouring State of Kelantan, visited Trengganu to report on the position of agriculture in that area and to make recommendations regarding the improvements possible.

The visit was made in November 1933, and his report and recommendations presented to the Government of Trengganu which is giving its consideration to the proposals outlined by Mr. Craig. Until such proposals have been accepted as the policy of that Government, publication would be premature. The descriptive portions of the Report, however, are of general interest, in view of which, we have the permission of the Trengganu Government to publish it in this Journal.

Rat Control in Krian.

The widespread damage by rats to standing crops of padi has been a subject of great concern to administrative and agricultural officers for many years past.

In the Krian irrigation area, with its wide stretches of padi land, the situation became so acute some years ago that it was necessary to organise a campaign to reduce this pest.

Concerted action by the padi-growers themselves was almost out of the question at that time. There was little or no cohesion amongst them, and the matter was of such urgency that time could not be wasted in educating them, and bringing them to a state of mind when they could launch a campaign of destruction with any reasonable expectation of success.

Consequently, the Government undertook systematic work of destruction, resulting in a considerable measure of success. Gradually, the position has changed. The rats are still present and so long as padi is grown, a ceaseless

war must be waged to keep their numbers down. But demonstrations, lectures and perhaps a fuller realisation of the danger, have resulted in a more enlightened attitude amongst the padi-growers and, in particular, amongst the headmen.

A new phase in this work has, therefore, come into existence in which the onus of first responsibility for the work has been shifted from the shoulders of the higher authorities, who hitherto had been responsible for the campaign, to the shoulders of the local headmen. In an article in this number on "Rat Control in Krian" an account is given of the present methods of control and of the measure of success so far attained.

While we repeat that ceaseless vigilance is necessary, in consequence of which supervision by this Department and by the administrative officers is still necessary, the measure of success attained is most promising and the amount of work done by the local headmen worthy of great praise.

Marketing of Eggs.

Attention has been drawn from time to time in the pages of this journal and in the Annual Reports of this Department, to the very large importation into Malaya of poultry and eggs. These imports, of course, represent only a portion of the total local consumption, for in many districts of Malaya systematic collection of poultry and eggs is made by Chinese dealers, who forward the produce to the larger markets.

It is desirable that the local production and marketing of poultry and eggs should be encouraged, and it is thought that the difficulties that are encountered are not insuperable. The Department of Agriculture is at present actively engaged in research work on the improvement of the local stock, while an officer of wide local experience in poultry husbandry has been engaged to instruct and encourage the small-holder in the breeding and care of poultry.

Scientific poultry-rearing in Malaya is as yet in its infancy. We seek knowledge on almost every aspect of the problem, in particular on diseases, stock suitable for the country and on correct and economic feeding.

There remains, however, the ever-present problem of marketing. To stimulate interest in poultry keeping we must be able to indicate marketing channels. It is a subject, therefore, that may be persued at once and need not wait for results of research work in other directions. In fact, the existence of organised marketing channels, such as may be provided by recognised co-operative societies, may be, and undoubtedly will be, used as a medium for introducing any improvements which become established.

It will be realised therefore, that constructive work with the object of increasing the local production of poultry and eggs, needs not only the collaboration of the Departments of Agriculture and Veterinary Science, but close touch with the Co-operative Societies Department. We would remark, in passing, that such collaboration exists; the Departments concerned systematically interchange reports on the lines upon which they are working and of the progress made,

while an Inter-Departmental Marketing Committee, composed of representatives of these Departments, meets regularly for the purpose of discussing problems of common interest in this connexion.

It may be thought that we have digressed from the title of this editorial, *viz.* "The Marketing of Eggs", but it was our object to indicate the reason why articles such as that published in this number on "The Co-operative Marketing of Eggs in Malaya" is of interest, not only on account of the valuable work of organisation which it describes, but also for the potential uses to which such societies may be put in the furtherance of the objects which the different departments approach—each from its own angle.

The four Societies at present actively engaged in the marketing of eggs are the pioneers of what, we hope, may grow into an important organisation. The Societies deserve the support of the public which we trust will be forthcoming.

Fish Production in Krian.

In previous numbers of this journal* accounts were given of the methods recommended for fish-rearing in Malaya. Considerable publicity was given to these articles. They were translated into the Malay and Chinese languages for publication in the vernacular journals of this Department and were reprinted in several vernacular newspapers in Malaya.

As a result of this publicity, and of further work by the Fisheries Department and by the Field Branch of the Department of Agriculture, carp-rearing has increased in the country.

In the present number of this journal we publish an article on "Fish Production in the Krian Irrigation Area" which recounts the varieties of fish favoured in that locality, and gives additional information concerning the yield of fish obtained and of its value.

One cannot but be struck by the very large yields that can be obtained from quite a small pond and of the value of carp-rearing as a subsidiary industry to other forms of agriculture—padi planting in particular.

In many districts where flesh foods are scarce and form but a small item in the diet of the poorer native, fish is of particular value; but away from the seaboard and rivers, it is generally expensive. The encouragement of fish-rearing in such localities appears indicated. With lack of transport facilities in many country districts, the establishment of numerous fish ponds seems desirable. This might reduce the amount of imported dried fish consumed in Malaya, a result which would be of benefit to the country and to the health of the individual.

* Rearing of Carp in Ponds, *Malayan Agricultural Journal*, Vol. XIX No. 8.
Transport of Carp Fry from China, *Malayan Agricultural Journal*, Vol. XIX No. 10.

Original Articles.

RAT CONTROL IN KRIAN, PERAK

BY

A. E. Coleman-Doscas,

Ag. Senior Agricultural Officer, Perak

and

W. D'Israeli Bird,

Rat Destruction Officer, Krian.

Introductory.

An indication of the extent to which rats are capable of damaging the Krian padi is afforded in an article by H. W. Jack, entitled "Destruction of Rats"* which states that at least six per cent., or about one million gantangs of the crop, in the Krian District of Perak was at that time destroyed by the pest.

In order to reduce this extensive loss, an organised campaign was instituted by the Department of Agriculture, and launched in November 1924,† over a selected area of some 30,000 acres comprising some of the highest-yielding rice fields in Krian.

Original Scheme.

Control Measures.

Initial control measures were based upon a Government subsidy for destruction, a monetary reward of one cent per tail being paid upon presentation at definite collecting and paying centres. Poison baits and traps were issued free, and endeavours were made to popularise various forms of organised hunting.

The results obtained from this campaign were considered to be sufficiently satisfactory to warrant an extension to cover the whole of the Krian District. The extended campaign was commenced in May 1925,‡ one European Officer, with five Malay Assistants being made responsible for the organisation.

The result of the campaign under the caudal system appears to have been satisfactory up to the end of 1929, in so far as no extensive damage to the standing crop was sustained. During the 1930-31 season, however, despite a substantial increase in rats slaughtered, the crop was severely damaged over an aggregate area of some five hundred acres, slighter damage occurring over a much larger area.

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* *Agricultural Bulletin of the F.M.S.* Vol. IX p. 271—276.

† Progress Report on a Campaign against Rats in Krian District, November 15th, 1924—March 31st, 1925. *Malayan Agricultural Journal,* Vol. XIII (1925) p. 168.

‡ Report on the Rat Campaign in Krian between the period May 15th, and end of August 1925. *Malayan Agricultural Journal,* Vol. XIII (1925) p. 364.

Tails accounted for up to the end of 1930 are given hereunder:—

Year		Tails paid for
1925	...	661,794
1926	...	673,102
1927	...	824,791
1928	...	914,644
1929	...	623,712
1930	...	1,791,790

Conclusions.

Experience gained over the period of subsidised destruction indicated the necessity for complete re-organisation of the system, since it was realised that a considerable expenditure was not providing an adequate measure of protection of the standing padi crop against damage by rats. One reason for this was believed to be that there was no great enthusiasm among the actual padi producers to undertake the capture of rats in order to gain the reward. Much of the money disbursed in rewards was collected by Tamil labourers and often for rats captured outside the padi-growing areas. A system on a re-organised basis was planned, and put into effect during 1931.

Modified Scheme.

It is unnecessary to indicate here the many disadvantages that were discovered to be associated with a system that rewarded the cultivators for undertaking the service of protecting their own interests, but it was decided that, in any modified scheme, the payment for tails must cease.

The District of Krian is subdivided into eight "mukims"; these again are subdivided into seventy-one smaller units of area, each under the control of a head-man styled *Ketua Parit.* It was suggested by Mr. J. D. M. Smith, then District Officer, Krian, that the *Ketua Parit* area should be the unit on which a new policy might be based, each *Ketua Parit* being responsible for the active co-operation of cultivators within his area. In return for the added responsibility, the *Ketua Parit,* in whose territory control measures had been efficiently maintained throughout the season, might be remunerated by a small cash bonus consistent with the results achieved.

Organisation.

The original campaign was controlled by the Senior Agricultural Officer in the State, stationed at Taiping, through a European Rat Destruction Officer and nine temporary Malay Assistants, each assistant being in charge of a definite number of *Ketua Parit* areas, in which *mukim* boundaries were observed in order to induce some measure of competition. Responsibility for rat destruction was transferred directly to the cultivator, the departmental organisation being concerned with the supply and distribution of traps and poison, and the supervision and demonstration of their effective use, together with extensive propaganda and instruction work throughout the District.

Control Measures.

Poison.

Sodium Arsenite. This poison has been found to yield satisfactory results, and after careful experimentation, the following formula was evolved for use and is considered to be effective and economical :—

Rice polishings	...	46 ozs.
Tapioca flour	...	45 „
Tallow	...	4 „
Palm Oil	...	47 „
Water	...	24 „
Salt	...	3 „
Sodium arsenite	...	18 „

These quantities were found to give a volume which could conveniently be mixed by one man in a small "Shanghai" jar, and which produced a mass of good consistency with a pleasant odour, machined easily, balled well and dried in a short period. A rapid method of balling has been evolved by passing the mass through an ordinary culinary mincing machine fitted with a plate containing a number of small round holes, about one quarter inch diameter, through which the material is delivered.

The cost per ton of the mixture, excluding making, packing and supervision is $98.83 (Straits Settlements currency). One ton of the mixture is sufficient for some 2,240,000 poison balls. These balls are readily taken by the rats and prove very effective. The flavour and aroma can be changed occasionally with advantage by substituting a small quantity of dried fish or prawns, for a similar weight of polishings and tapioca flour.

With a large-sized machine, four men could in a week, make, dry, and pack up to one ton of poison balls.

The baits were laid at frequent intervals along *batas* and bunds, especially at or near the entrance to holes. Roadside drains, village boundaries and waste land were treated in a similar manner, except that near any habitation the bait was usually placed in a bamboo to prevent it being taken by domestic animals. It is considered that rats are attracted by freshly turned ground, and a little scraping of the soil near the bait was advocated.

Cultivators prefer to mix the prepared poison baits with tapioca roots, fish or coconut, to render them more attractive. To allay suspicion, the baits are usually concealed beneath a small heap of padi husk, and it is claimed that, by employing this method, baits are more readily taken.

Barium carbonate. This material can be handled and used with a greater measure of safety than sodium arsenite, and is very effective in destroying rats. Baits prepared in accordance with the following formula have been used with success in Krian :—

Rice polishings	...	48 ozs.
Tapioca flour	...	48 „
Barium carbonate	...	64 „
Tallow	...	4 „
Palm oil	...	48 „
Water	...	48 „

Freshly prepared baits should immediately be placed on dry racks, and dried in the sun before use or storage, to prevent possible mould growth and consequent deterioration.

The cost of the ingredients for the preparation of one ton of poison balls, is approximately $80 (Straits). The method of manufacture is similar to that used in connexion with sodium arsenite.

Certain insects, more especially cicadas, grass-hoppers and dragon flies, are particularly relished by rats, and barium carbonate, being odourless and tasteless, can be used with almost certain and deadly effect by placing about two grains of the powder in the body cavity of any of these insects. Small doses of barium carbonate are not fatal to human beings or domestic animals, and it can, therefore, be used with relative safety in and near dwellings; safety precautions, however, should always be taken.

A useful method of capturing dragon flies is to smear small twigs with the latex of the jack fruit tree, and place them at the edges of water holes and streams frequented by the insects.

In preparing baits it is always advisable to smear the hands with an essential oil e.g. oil of aniseed, to mask the human smell.

It is interesting to note that poison baits, for which no general success was claimed under the initial scheme, enjoyed an almost immediate popularity. During the period June—December 1931, 18,022 pounds of poison balls were distributed; this represents approximately 18,,022,000 poison baits, each containing 0.696 grains of sodium arsenite. It has been suggested that under the caudal payment system, poison was not extensively used because rats poisoned by one cultivator would probably go to another owner's land to die.

The distribution of poison is well organised. The *Ketua* of a unit area is supplied direct from the manufactory: in addition, the Malay Assistants are responsible for distribution in native homesteads, and also have a poison stall at all village fairs where material is issued to those requiring it.

Traps.

Steel Traps. Early observations indicated that good results could be obtained by using a cheap imported type of steel break-back trap, which could be obtained in cases of twenty-five dozen, at eighty-five cents per dozen. Under field conditions, these traps require constant care and attention to prevent them from becoming rusty and consequently going out of order; while in addition, they need daily visits for re-setting and baiting. They are, however, largely used on Padi Test Plots and Stations in Perak, and give very satisfactory results.

As with poison, the human smell should be masked when handling traps, and this can be done economically and effectively by smearing the hands with mud, or holding them over the smoke of a small grass fire.

A large variety of baits may be employed, the most effective being padi, dried fish or prawns, tapioca root, coconut meat—preferably heated over a fire before use—and the insects mentioned in connexion with barium carbonate. One disadvantage of using padi as a bait is that the trap is often sprung by birds.

During 1931, 23,860 steel traps were distributed to cultivators in Krian, but it was observed that these were not used to nearly the same extent as previously, and it can only be presumed that this was due to the trouble of baiting, resetting and maintenance, coupled with the cessation of tail-money. The free supply of these traps has now been discontinued, and endeavours have been made to popularise simple home-made contrivances which can be constructed by the cultivators themselves at very little cost, and which are efficient and require little attention.

Deadfall—The deadfall trap was advocated by the Department of Agriculture in 1921 and two simple forms of deadfall trap which can be made at small expense are now largely in use. One known as *perangkap timpa* employs a flat board weighted with a big clod of earth and supported by a small wooden pin, which is connected to a trip mechanism situated near the bait. A slight movement of the mechanism causes the wood to fall upon the victim. Another form known as *kuching tuli* or *kuching pekak*, embodying a similar principle, is made in the form of a narrow trough for use in runs; in this case a heavy block of wood is released as soon as the trip is operated.

Bamboo—a very simple method of catching rats, and one that should have a large appeal to the padi cultivator since it does not require setting and needs very little attention, consists of a length of bamboo about four feet long, with all the nodes removed. The diameter should be big enough to allow a large rat to enter. The bamboos are concealed in the undergrowth or along runs therein, in such a manner that one end is invitingly displayed in the direction from which rats may be expected to come for cover after a nocturnal forage. It appears that rats will readily take cover in a well-placed bamboo, providing it has been thoroughly dried before use, and remain there much the same as in their own tunnels.

The traps are tested for a catch by simultaneously closing both ends with a handful of grass and shaking: the rodent may be disposed of by submerging the bamboo in an adjacent drain; a more popular diversion is to the club the animal to death as it is shaken from one end. As snakes are sometimes found in this form of trap, care should be observed in the method of despatch. Bamboos have the advantage of not being limited in their effective capacity, for more than one rat may be caught at a time.

Bamboos tried over a small area gave very satisfactory results, and the method is now being extended to test its possibilities on a large scale.

Ratfast—an adhesive preparation manufactured by Mr. Parker of Bagan Serai, was tried under field conditions. The material is placed in shallow trays with a bait in the centre. On exposure in the field it was found that the viscosity was affected by changes of temperature, and if the trays were not carefully placed the material was lost. No suitable technique for field use was evolved. Where shelter is afforded, however, as in houses and stores, ratfast can be used with excellent results.

Control Effect on Sex Ratio.

With a view to ascertaining whether any measure of control exerted an influence on the sex ratio of the rodent, an examination of rats killed by trapping and poisoning over a period of several months disclosed the following:—

Traps.		Poison.	
Males	Females.	Males	Females.
36,193	54,601	29,812	38,892

It would appear that both trapping and poisoning tend to displace the ratio in the direction most suitable for assisting in efficient control.

Species of Rats.

A large number of rats caught in the field have been submitted from time to time to the Institute for Medical Research, Kuala Lumpur, and Raffles Museum, Singapore, where identifications have been kindly undertaken. Some of the species, however, have not yet been definitely determined.

Based on information received and observations on specimens obtained, the Agricultural Field Officer, Krian. Mr. R. G. Heath, puts forward the following classification of rats of economic importance in the Krian district:—

1. *Rattus Norvegicus,* Malay *Tikus Mundok.*

The English brown or wharf rat, a very large animal with whitish feet and tail. Common in coastal areas in the vicinity of dwellings.

2. *Rattus rattus jalorensis.*

An indigenous, white-bellied jungle animal, tail rather longer than head and body combined; teats, 2 pairs pectoral, 3 pairs inguinal.

3. *Rattus rattus diardi.*

The "Commensal" dark-bellied form, frequenting homesteads, very similar to *jalorensis* in build, but underparts range from drab to chestnut.

4. *Rattus rattus argentiventer.*

The common rice field rat, tail normally shorter than head and body combined. Teats, 3 pairs pectoral, 3 pairs inguinal.

The Malay *tikus ladang* appears to embrace 2, 3 and 4 above.

It is not possible, at present, to indicate to what extent the species described above are responsible for damage in rice fields. It is of interest to note, how-

ever, that *Rattus rattus argentiventer* is the species most commonly met with in the open rice fields in Krian, while *Rattus norvegicus* and *Rattus rattus diardi* are localised—the former in the coastal area, and the latter in the inland districts of Selinsing and Gunong Semanggol. There is no concrete evidence that *Rattus rattus jalorensis* is a pest of padi although it is extremely likely that it is.

Although there is a definite movement of rats during the year, migration is not pronounced owing, no doubt, to the very mixed nature of the cultivation in the District, both within and without the rice-growing areas, and also to the presence of dwellings and towns, together with industries such as fish-preserving, poultry-raising and rice-milling, from which sources an adequate supply of food is available.

In the rice fields, a pronounced increase is evident following planting, and would appear to culminate after harvest. Damage to nurseries is, as a rule, only slight, and the main crop is not seriously attacked till it has become well established, when the succulent stalks are gnawed through near ground level, usually some distance from a bund, *batas* or other centre of rodent concentration. As the crop develops towards maturity, depredations increase in severity. At this stage there appears to exist a marked association between water supply and rat damage, as an excess of water is invariably accompanied by increased damage, possibly due to the facility thus afforded for reaching the ears; similar results are experienced if water is insufficient.

The appearance of a rice crop damaged by rats is very characteristic. In any plot where depredations occur, the damage is invariably confined to the centre; even in bad attacks, where the affected crop presents the appearance of having been trampled by heavy animals, the perimeter, especially if adjoining *batas*, is rarely even touched. The only reason that can be adduced for this systematic method of attack is that the crop which escapes attention forms a screen to shelter the rats and to hide the holes and runs in the *batas*.

Runs and tunnels are constructed on the banks of distributaries and drains, but these would appear to be used mainly for purposes of shelter and protection. During the breeding season, which extends from harvest (February) to about July, burrows are made in the dry grass bunds, and in these the young are produced. Undergrowth or accumulations of vegetable material may also be used to accommodate nests.

Breeding would appear to be extremely intensive and as many as eighteen young rats have been found in a nest. On one occasion, two nests were discovered side by side each occupied by a female nurturing two litters, one at teat and one just old enough to break for cover. The total of both nests amounted to fifty-six rats.

AGRICULTURE IN TRENGGANU

BY

J. A. Craig,

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The following notes are abstracted from a fuller report on a tour which the writer made to Trengganu, at the request of the Government of that State, to report on agricultural conditions and to formulate proposals for agricultural development in Trengganu.

The writer takes this opportunity of thanking all officers in Trengganu with whom he came in contact, for their kindness and hospitality and for their help throughout the visit.

Trengganu is divided into four Administrative areas, their boundaries following the water-sheds and for the purpose of description it is most convenient to follow this arrangement.

The Jajahan Barat, comprising the two northern districts of Besut and Setiu, is drained by rivers of those names and forms a large coastal plain which varies in width from about three to twelve miles. In the north west, this plain is abruptly bounded by high precipitous hills, but over the greatest length of the district the plain runs into quartzite foot hills which in turn lead to mountainous country. The soils of this plain follow closely those found elsewhere on the east coast—namely, a high coastal bank of practically barren sand extending inwards from the sea for distances up to three or four miles, behind this sand a comparatively narrow belt of deep swampy organic soil from which a heavy alluvial loam stretches back to the foothills in the vicinity of which the soils become lighter in nature and contain a considerable amount of gravel and sand.

The Kuala Trengganu district is drained by the Trengganu river and its tributary the Nerus. The sequence in soils from the coast is similar to that found in Besut except that both sand and deep organic belts are narrower, the latter in places being absent. In this district also there is a very extensive plain, the soils of which vary more than those in Besut in that there is a considerable quantity of light-coloured clay or heavy loam in addition to the predominant alluvium. The soils of the undulating and hilly country on the western margin of this plain are of a coarse and easily washed character.

The Jajahan Timor is, in effect, an immense plain broken up by three low ridges of hills running roughly north and south. Between the sea and the first range only the coastal sand and organic soil types are found but beyond this, good alluvial and other light-coloured clay and loamy soils are found. In the vicinity of the Kemaman River, undulating land approaches rather more closely

to the coast than elsewhere and this soil is somewhat coarse and sandy. In the vicinity of Kemaman also there appears to be a greater proportion of the organic type than elsewhere.

Treated as a whole, the State comprises four main soil divisions: the coastal sandy strip of little or no agricultural value; the deep swampy region immediately behind the coast; the immense plains of loamy soil which merge into undulating country and foothills of a coarse nature.

The area of the State is computed as 5,000 square miles and the population in 1931 proved to be 179,000 persons. This population is, however, not distributed throughout the State, but is concentrated on the coast line, in Kuala Trengganu District and in the vicinity of the Besut river.

Agricultural development in other parts of the State is negligible and the little that has taken place is confined to narrow disjointed strips of river bank cultivation, for the people are primarily fishermen and little interested in agriculture, though in this connection it is probable that the barren coastal sand bank has formed a barrier discouraging them from penetrating inland or turning to agricultural pursuits.

The standard of knowledge on agricultural subjects and everyday procedure is, for a country population, surprisingly small, the people having no idea of adapting procedure to conditions and no knowledge of the varieties of rice or the cultivation of alternative crops. The people appear to be receptive of what were to them new ideas and are prepared to put those at least to the test.

Padi.

Four types of padi are cultivated in the State namely—

(1) Padi chedongan — Wet transplanted padi.
(2) Padi taboran — Padi broadcast on dry land.
(3) Padi tugalan — Padi dibbled in on dry land.
(4) Padi huma — Padi dibbled in on burnt off jungle land which is subsequently allowed to grow up in jungle.

The cultivation of wet padi in large areas is confined to Besut and Kuala Trengganu Districts. A few small native-built irrigation dams have been constructed though, for the most part, the crop depends for water on rainfall and the yield, therefore, fluctuates from year to year. In both of these localities the crop appears to be well cultivated and cared for. In other districts, cultivation of wet padi is confined to small and isolated blocks in which there is a marked lack of collective effort and only a slight understanding of pest control. In certain areas the most elementary principles of cultivation and water control are not understood.

Padi tugalan, on the lines of the Kelantan dry padi, is not extensively planted and though a few well-cultivated plots are seen, the principles underlying the cultivation of this crop are not generally understood so that correct procedure is often a matter of luck and the crop more variable than should normally be the case.

Padi taboran is grown on land suited to padi tugal and is planted either because the owner knows no alternative form of cultivation, or because he has too much land to plant and care for by the superior tugal method. After three ploughings and harrowings, the seed is broadcast and harrowed in and thereafter the crop is left to itself. Weeding is impossible and the padi becomes wholly or partially choked with grass. Seeding is too close to allow plants to develop properly and a great waste of seed occurs. This is an exceedingly wasteful form of cultivation from every point of view, but particularly in relation to land which is planted for two years and fallowed for one or two season the crop at its best can only be a partial success and can never be economic.

Padi huma is grown extensively throughout the State, but especially so in the Jajahan Timor and Ulu Trengganu. One is struck by the lack of primary jungle which is attributed to this wasteful form of cultivation. The jungle is felled and burnt off after which either one or two crops of padi are removed, the land then being allowed to grow up in secondary jungle and the cultivator moving to a fresh site.

Varieties of padi.

As might be expected, a number of the varieties grown in Besut are the same as those planted in Kelantan and the same applies to a lesser extent to Kuala Trengganu, but a fact which must have a very great effect in diminishing yields is that a large number of cultivators make no differentiation between types of padi and use the same variety on wet and dry fields. Whether this is due to the loss of types through careless storage of seed and mixing until seed gives the same yield under either condition, or whether it is due to some major calamity in the past wiping out the dry types is not clear. As might be expected under the circumstances, cultivators—even in the more advanced areas—have no ideas as to the best varieties for any particular soil type and it is probable that, even in Besut and Kuala Trengganu areas, varieties are so mixed as to mask completely differences in yield. The determination of the most suitable varieties of wet and dry types and the maintenance and distribution of these varieties is work of primary importance.

Rubber.

Rubber holdings seen throughout the State are, for the greater part, under a heavy cover of undergrowth bordering on forest conditions, though in this matter again Kuala Trengganu is superior to other localities. Tapping generally is of a low standard, but the quality of rubber produced is exceedingly high for small-holding produce and is definitely superior to Malay small-holders' sheet in the writer's experience of the Federated Malay States. The sheet seen in Paka Chukai and Kuala Trengganu was cleanly prepared and well cured by smoking. In Paka it was stated that hand rollers were either owned individually or by groups of three and four small-holders; the same remark applies to the small smoke-sheds seen which are constructed of roughly-squared timber

with walls of bark collected in the jungle, the fires being external and the smoke led into the sheds through hollowed-out tree trunks. Besut is the only district in which block rubber uncured and full of water, sand, bark and other impurities is prepared. The increase in export duty to the same figure as that for sheet, or the establishment of a diminishing quota system for this type of rubber would raise the quality and bring more money into the State.

Coconuts.

Extensive cultivation of this crop is confined to the sandy coastal belt, though one European-owned estate, which was not visited, exists near Kretir. Palms, except in thickly populated areas, have a somewhat unhealthy appearance and produce small yields. The copra produced, at least during the wet season, is of a low grade, the owners of holdings having no idea of adequate curing, or of the construction of kilns to effect this. The conditions pertaining to small yields and small holdings owned by fishermen point to the need for the adoption of co-operative kilns, but in this as in other things, education in market requirements, nut harvest and manufacture—which cannot at present be given—are urgently required.

Arecanut and Gambier.

These two products to the value of $112,000 and $42,000 respectively, were exported from the State during 1932. Arecanut normally occurs as a casual *kampong* crop and not in large defined areas. The nut is exported in both smoked-cured and sun-dried forms. No gambier holdings were inspected. Considerable areas of land suitable for one or other of these crops are available in Dungun and Besut.

Tobacco.

Cultivation of this crop has increased considerably in the last two years. Individual holdings are small though one estate of 10 acres owned by a Sumatran Malay has come into being at Batu Hampar. Small-holders' leaf is sun-dried and sold to local Chinese dealers who sort, press and chop the leaf and produce a type of tobacco popular among native consumers by treatment with groundnut oil and rouge.

Other crops.

The writer was impressed by the absence of crops other than those mentioned above; bananas and other fruit, tubers, beans and vegetables of all kinds appear to occupy the lowest place in the economic life of the *kampong.* The difficulty in obtaining a variety of planting material is obvious, and was mentioned by both raiats and school teachers.

School Gardens.

The only Government Schools visited were those in the Jajahan Timor, the gardens in all cases being situated on the coastal sand which makes the

raising of good crops difficult. In Kemaman and Paka, fair attempts at cultivation have been made, but there was a marked lack of variety in crops grown while lay out and cultivation were generally poor.

Stock.

The State carries an animal population estimated at 20,000 buffaloes, 23,000 cattle and 228,000 poultry as well as sheep, goats and pigs.

The greatest number of cattle and buffaloes are found in Besut and Kuala Trengganu Districts. The cattle are of the small Siamese type and are used entirely for draught purposes. In Besut, the animals are in much better condition than those in Kuala Trengganu, as in the latter District no adequate grazing is available. Hens and ducks are of good average quality and it is surprising that exports are only in the region of 500 head per annum. The organisation of groups of peasants to ship poultry to Singapore would give the people extra money and encourage breeding of poultry.

Epidemic poultry diseases are said to be common, but these can only be overcome by education in feeding, housing and general sanitation and the provision of veterinary facilities.

The very backward state of agriculture in Trengganu is attributed to a number of causes among which stands the nature and the sparsity of the population. As has been remarked before, the people are primarily fishermen and have little knowledge of agricultural practice. Except in Besut and Kuala Trengganu Districts, cultivated areas are small and isolated; this fact in itself makes for serious diminution of yields of all crops, owing to the depredations of pests and unless long distances to a centre are to be covered, reduces the available market to a few individuals. The peasant, therefore, tends to cater only for his own needs, produces no money crops and is unable to make purchases from the outside world or to pay land rent.

Trengganu with its huge areas of well-watered and unopened plain, has immense agricultural possibilities the adequate utilisation of which are of prime importance not only to the State but to Malaya as a whole. The lie of the land and the types of soil render the country suited to the cultivation of padi and a large variety of other food crops which would tend greatly to reduce the reliance of the Peninsula on imported supplies, but in this connexion it must be stressed that if it is the policy of the Government to convert the State into a rice-exporting country, it will be necessary to spend considerable sums of money on irrigation, for though dry padi will supply the food of the peasant it is seldom that this type will produce a saleable surplus. The country is one which in view of the nature of the land and the large number of rivers, appears to the layman to be ideally suited to irrigation. The provision of controlled water would, in addition to ensuring the padi crop, greatly increase the productivity of the land in other crops during the dry season.

Concurrent with the necessity for irrigation in a policy concentrating on rice production goes the need for milling facilities to provide a market for the crop. In view of the reliance on rainfall for irrigation water and the possibility of growing other crops during the dry season, the trial of certain heavy-yielding short term varieties of padi from the Pulau Gadong Station in Malacca would be valuable.

In the normal course of events, cultivation must for a large number of years be confined to the plains occurring throughout the State and on these a system of dual cropping—padi followed by a short term crop during the dry season—should be encouraged. The actual crops most suited to conditions are a subject for experiment, but until this has been established, tobacco, groundnuts, loofah, cucumber, brinjal, chillies and cow-pea and possibly soya bean are suggested as suitable crops. In localities where large holdings of dry land result in the cultivation of padi taboran it would, for the present, be in the interests of the State to encourage peasants to adopt the *tugal* system of cultivation on a smaller area and plant the remainder of their land with either long- or short-term food crops.

The efficient cultivation of available land and the development of potential land on the lines indicated, by people having such a rudimentary agricultural knowledge, is impossible and unless provision can be made for Agricultural Services to educate the peasantry and carry out experiment and demonstration work, waste of land and the loss of very great potential supplies to the whole country will result.

THE CO-OPERATIVE MARKETING OF EGGS IN MALAYA

BY

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It is a matter for surprise that in Malaya, which is predominantly an agricultural country, it should be found necessary to import large quantities of poultry and eggs; but such is the case, and from the figures given below it will be appreciated that the imports are on a considerable scale.

Net Imports into Malaya of Poultry & Eggs.

Year	Poultry, Alive		Poultry, Dead		Eggs, Fresh & Salted		Total value Poultry & Eggs $
	Quantity No.	Value $	Quantity Tons	Value $	Quantity per 100	Value $	
1930	1,120,972	1,011,720	89	124,309	488,185	1,249,369	2,385,398
1931	875,727	708,286	74	89,890	377,672	692,085	1,490,261
1932	930,597	611,685	37	43,608	170,733	293,305	948,598
1933	826,598	515,294	46	45,349	203,402	316,302	876,945

An investigation of conditions among the Malay poultry owners in the District of Krian, in which it was known that considerable numbers of poultry were kept, showed two factors which militated against the popularity of keeping poultry. In the first place, the flocks were liable to be decimated by disease and in the second place, the price paid for eggs to the poultry owners, who carried the risk of losing the birds in addition to the labour of looking after them and the expense of feeding them, was ridiculously low. The majority of the rayats were in the habit of selling their eggs to higglers, usually of Chinese nationality, who travelled round the kampongs and paid on an average about fourteen cents for ten eggs. The eggs eventually arrived in the markets and were then retailed at from twenty to thirty cents for ten.

This method of marketing is obviously most unsatisfactory, both from the point of view of the poultry owner and of the ultimate purchaser in the market. The price obtained by the seller is insufficient to encourage poultry-rearing on any scale while the egg, by the time it reaches the breakfast table, is almost inevitably stale.

A solution of the problem appeared to be possible by introducing among the rayats a method of marketing eggs on co-operative lines and efforts were made in March and April 1932 to interest the members of the Tebok Haji Musa Rural Co-operative Credit Society in a co-operative scheme and to find a market for their eggs. The first order obtained was from the Runnymede Hotel, Penang, and a regular supply to this Hotel has been maintained ever since.

There are, of course, on the market most elaborate machines for grading and candling eggs, but naturally the use of any expensive apparatus of this kind is out of the question when working in a Malay *kampong* on a small scale and a simple method of candling and grading, which however proved in practice to be quite efficient, was evolved. The *modus operandi* adopted by the Society was for the eggs to be brought in daily to a collecting station by the individual members and, after being graded to eliminate small ones, they were candled to ascertain whether they were new laid. Those which passed these tests were then "chopped" with a rubber stamp "Co-operative Poultry Products" and the member credited with the number of eggs accepted. For packing purposes it was found that the small wooden cases used for importing tins of condensed milk were procurable at about six cents each and, after a few trials, it was decided that a case would hold 200 eggs with reasonable security from damage. Fortunately, as Krian is a padi-growing District, there is always plenty of padi husk available and this was found to be an excellent medium for packing. After the business had been carried on for a few months, suspicion arose that consignments were being tampered with and to overcome this difficulty the cases were bound with wire and the wire sealed before despatch from the Society.

This experiment having worked satisfactorily for a few months, it was decided to extend the scope of the operations and an Agent was found who was willing to open a stall in the Kuala Lumpur Market and to make house to house deliveries. In order to maintain the supply, three more Rural Credit Societies in Krian were brought into the scheme in September 1932. During October and November, supplies were despatched to the General Hospital, Singapore, but this order was, for various reasons, terminated and it was decided to concentrate on supplies to marketing centres nearer to Krian than Singapore.

At the outset, each Society worked individually, but in November 1932 it was arranged that a Union of the four should be formed and a flat rate paid to the members as the Societies which were fulfilling the least lucrative orders naturally regarded it as a hardship that the net price obtained should vary in the different Societies. It was found impossible to fix a standard price for all orders, as market prices varied in the different centres which were being supplied and the prices paid to the Societies had necessarily to be varied in order to compete with the local dealers. No attempt was made to undersell the local dealers and the prices charged were if anything slightly higher, the Societies relying upon selling an egg of a fairly standard size and, moreover, of a guaranteed freshness.

In order to reduce the time from the *kampong* to the consumer it was decided that consignments should be sent by passenger train, although this entailed a greater expenditure upon freight and a reduction of the net profits. The usual course in the case of consignments to Kuala Lumpur is for the eggs to be collected in the morning in Krian, examined for cleanliness, graded, candled, stamped and packed and finally despatched by the night mail to Kuala Lumpur. They are collected by the Kuala Lumpur Agent at 6.30 a.m. and as a general rule, are disposed of the same morning so that there is no reason why they should not be available for the breakfast table less than 12 hours after leaving Parit Buntar Railway Station.

In the year 1932, the four Societies concerned sold 143,000 eggs and realised thereby $3,520. The following year an Agent was found who was willing to sell the Societies' eggs in Ipoh and a regular order was obtained from St. Margaret's School, Fraser's Hill. During the year, the Societies engaged in this business sold 278,430 eggs and the average net price paid to the members throughout the year, after deducting all expenses, amounted to $1.92 per hundred, which must be considered satisfactory, as the average price per hundred which would have been paid by the higglers would have been in the neighbourhood of $1.40 only. In addition, the business gave permanent employment to five Malays.

There is no doubt that the members of the Societies engaged in the co-operative marketing of eggs are fully alive to the benefits which have been derived from the business and when, during temporary scarcities of eggs, the higglers offered higher prices they remained loyal to the Societies and maintained their regular supplies.

The only serious criticism, so far, has been that the average size of the eggs is small. The blame for this lies with the poultry and not the co-operators and now that those concerned realise that there is a reasonable profit to be made by the marketing of eggs on co-operative lines, the improvement of the breed and an increase in the number of poultry kept in the kampongs should follow as a natural corollary.

FISH PRODUCTION IN THE KRIAN IRRIGATION AREA

BY

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Fish production constitutes an industry of some economic importance in many parts of the Krian irrigation area. It is an industry intimately bound up with padi cultivation and one that provides a valuable source of revenue for the Malay cultivator, additional to that which he receives from his padi crop.

The fisheries depend entirely on air-breathing fishes belonging to one or other of the following families :—

(1) Anabantidae
(2) Ophiocephalidae
(3) Siluridae.

Of the fishes commonly met with, the "sepat" ("sepat Siam" and "sepat padi") together with the "puyu" (climbing perch) belong to the first, the "aruan" (murrel or serpent heads) to the second and the "keli" (catfishes) to the third group.

The most important fish is the "sepat Siam" or "sepat benua" (*Tricopodus leeri*). This fish was introduced into the mukims of Bagan Tiang and Tanjong Piandang some years ago and has since spread throughout the district.

The "sepat Siam" is an extremely hardy fish, a prolific breeder and of high value as a food owing to it's oily character. The fact that it is air-breathing makes it easy to transport; this feature, combined with it's breeding habits, renders it possible rapidly to populate a new area by introducing merely a few pairs of the fish.

Among the Malay cultivators, there are many who dislike "sepat Siam". They insist that it is an extremely pugnacious fish and drives away good fish like "aruan" of which they are extremely fond. This may or may not be the case; but primarily, it is a vegetable and silt feeder, preferring to grub around the roots and stems of the padi and other plants seeking a mixed diet of algae and infusoria.

During the padi season, the "sepat Siam" are caught in the padi fields, irrigation canals, drains and other water courses. Catches are heavy during rainy weather. Following a heavy storm, many people can be seen at work with cast nets (M. jala), lift nets (M. tangkol) and rods reaping the benefit of the washing into the drains of large quantities of fish of all kinds, more particularly of "sepat". It is said that on occasions of this kind, cultivators may catch, in one morning, fish to the value of from 50 cents to $2.

A very common method of capturing "sepat Siam" in Krian is by means of wells (M. telaga) in the padi fields. These wells vary in size. In the coastal mukims, 30 ft. x 20 ft. is a common size and there is normally only one well

to each Lot of approximately 5 acres of land; whereas in central and south Krian the wells are usually much smaller, and there may be two or more to each Lot. The wells are dug in the lowest portions of the padi fields so that they retain water even when the rest of the field is dry. Coconut palms are often planted around the edges of the wells to provide shade. The fish breed in the wells, spreading over the fields after irrigation has taken place. They are caught in the fields, largely by means of rods, during the growing period of the padi. When the padi is ripening and the water is being run off the fields, the fish collect in the wells. The wells are then bailed out and all the fish are taken except a few, which are retained for the next season's breeding. Many small water courses, such as exist around house sites, are similarly cleared. The bulk of the catches from wells usually consist of "sepat Siam". Most of the "sepat Siam" caught by the Malay cultivators are sold fresh to Chinese dealers at a price varying from $1 to $4 per pikul. The Chinese behead and gut the fish which are then salted and sundried. From 2½ to 3 pikuls of fresh "sepat Siam" are required to prepare 1 pikul of the salted and dried product. Considerable quantities of salted "sepat Siam" are exported to Sumatra and Java as well as sold in the local markets.

Yields of fish taken from wells vary considerably. It is said that some wells are capable of producing a return of as much as $70 per annum, but a more usual figure would be from $10 to $40 per annum. The heaviest yields are recorded in the coastal mukims. The following figures taken from Kuala Kurau in April 1932 give some idea as to the yields attainable: —

Size of well		*Yield of fish in kati*
18 ft. x 32 ft. x 6 ft.	...	500
19 ft. x 29 ft. x 6 ft.	...	1100
20 ft. x 32 ft. x 6 ft.	...	600
21 ft. x 30 ft. x 6 ft.	...	2800
18 ft. x 30 ft. x 6 ft.	...	280
22 ft. x 32 ft. x 6 ft.	...	1300
20 ft. x 30 ft. x 6 ft.	...	400
22 ft. x 32 ft. x 6 ft.	...	900
20 ft. x 30 ft. x 6 ft.	...	300
21 ft. x 32 ft. x 6 ft.	...	900

A small well at Titi Serong Experiment Station, size 24 ft. x 24 ft. x 6 ft. yielded in January 1934, 200 kati "sepat Siam", 50 kati "aruan" and 100 kati "keli". Taking the prices ruling at the time of 2 cents per kati for "sepat Siam", 5 cents per kati for "aruan" and 3 cents per kati for "keli", the value of the catch works out at $9.50. In 1932, an irrigation drain at Kuala Kurau 360 ft. long, 8 ft. wide and 6 ft. deep, yielded 16,000 kati of fish.

Associated with the "sepat Siam" is a smaller species known as "sepat padi", "sepat jawi" or "sepat ronggeng" (*Tricopodus trichopterus*). This species seldom exceeds 3 to 4 inches in length as compared with the 7 to 8 inches

of "sepat Siam". Carrying, as it does, a very small amount of flesh, it is of little value as a food.

Next in importance to "sepat Siam" are the fishes belonging to the genus Ophiocephalus and known collectively as "aruan". These are predatory fish and feed largely on frogs and small fish other than "sepat" and "keli". They breed largely in shallow water, often among the grasses and weeds alongside the division ridges of the padi fields. They are capable of travelling overland and can bore through the division ridges of fields in cases of necessity. They grow to a fair size and, when full grown, may weigh from ½ to 1½ kati. They are caught by means of rods or sometimes with long poles baited with dead frogs. They are also found in wells, although "sepat Siam" provides the bulk of the catches taken in that way. Only occasionally are "aruan" captured in traps. The Malays sell the greater part of their catches of "aruan" to the Chinese, but preserve a certain amount for their own use by salting or pickling (M. pekasam). "Aruan" transport well and are sold alive in the markets of large towns at a retail price of from 10 to 16 cents per kati. The local dealers purchase "aruan" from the Malays at prices from 4 to 10 cents per kati.

Third in importance are the "keli' or catfishes (Clarias sp). These fishes are omnivorous, they feed largely on excrement, but it is doubtful whether, under the Krian conditions, they can obtain sufficient to make it an important article of diet. They also devour frogs, frog spawn, larval insects and small fishes. They are furnished with special accessory organs of respiration and can travel overland, sometimes for considerable distances; they are also able to bury themselves in the mud and survive for a considerable period without water. They are prolific breeders. They are caught mainly in traps in the padi fields, but are also met with to some extent in the wells. Not all Malays appreciate the "keli" as food, but a proportion of the catch is usually salted or pickled and preserved by them, the remainder being sold fresh to Chinese dealers. They transport well and are sold alive in the markets of the large towns. The local dealers purchase "keli" from the Malays at prices from 4 to 7 cents per kati.

The "puyu" (*Anabas scandens*) belongs to the same family as the "sepat". It grows in some cases to a size of 6 to 7 inches and is very much relished as food by Malays. It feeds largely on moss and lichens. It is not so commonly met with as "sepat", "aruan" or "keli" and is mainly caught in traps. The bulk of the catches are not sold, but are retained by the Malays for pickling and preserving to tide them over the dry season.

All the species of fish mentioned above flourish in the padi fields of the Krian irrigation area. They bring to the Malay population of the District, more particularly in the coastal mukims, a useful item of revenue additional to that derived from their padi crop. In some cases, the value of the fish produced is said to be worth as much to the cultivator as is his surplus rice crop. In the majority of cases, fishing provides him with the means of paying his land

rent and water rate. It is a source of income requiring but little exertion to obtain and one that might well be adopted by the Malay cultivator in other parts of the country where conditions are suitable for the purpose.

It is, unfortunately, impossible to obtain full data relative to the exports from the district of fish caught in the padi fields of Krian. This is due to the fact that three of the four important varieties of fish caught, namely "aruan", "keli" and "puyu", are exported fresh and are not subject to any form of export duty. Figures supplied to the writer by the courtesy of the Superintendent of Customs, Krian give the exports of dried "sepat" from Krian district during the year 1933 as amounting to 2609 pikul 73 kati, the bulk of which went to Penang. These figures do not by any means represent the true state of affairs, however, as a large part of the catch is transported, in a fresh condition, over the boundary into Province Wellesley, there to be salted and sundried.

The Fisheries Officer reports that from six Chinese dealers in 4 centres 6,500 piculs (382 tons) of fish were exported in 1933 to Singapore and Penang.

The Malays of Krian district take little or no part in the marketing of the fish captured by them. Taking into account that salted and sundried "sepat Siam" is retailed in the towns at a price of 20 to 22 cents per kati whereas the fresh fish is sold by the Malays to Chinese dealers at 1 to 4 cents per kati ($2\frac{1}{2}$ to 3 kati "sepat Siam" will give 1 kati of the salted and sundried product), it seems surprising that the Malays do not make an effort to perform the salting, sundrying and marketing operations themselves. There would seem to exist a definite scope for the introduction of some form of co-operative preparation and marketing as regards the production and sale of "sepat Siam" in Krian District. The same remarks are applicable to the marketing of fresh fish such as "aruan" and "keli". The main drawback to the initiation of co-operative methods seems to be lack of capital on the part of the Malay producers. The capital required to initiate such methods would be large, inasmuch as the Malays would require prompt payment in cash for fish supplied.

In conclusion, the writer wishes to express his gratitude to Mr. W. Birtwistle, Officer-in-charge, Fisheries Department, S.S. and F.M.S. for the very considerable amount of information and assistance rendered by him in connexion with the preparation of this article.

Note.—1 kati = $1\frac{1}{3}$ lb. 1 picul = 100 kati.

Abstract.

PAPAYA AND PAPAIN. *

General Information.

The papaya or papaw is a fruit tree widely diffused throughout tropical regions. It has attracted attention because of the papain contained in the whitish latex of the the stems, leaves and rind of the fruit, containing an enzyme by means of which albuminoids may be dissolved and digested, so that it serves the same purpose as pepsin.

The exports of papain from Ceylon have increased considerably in recent years. The exports from that country in 1932 amounted to 64,356 lbs., valued at Rs. 338,247. Of this quantity, 16,022 lbs. were consigned to the United Kingdom and 45,575 lbs. to the United States of America. The total imports of papaw juice or crude papain into the U.S.A. in 1932 were 54,491 lbs.: 80 per cent. of these were from Ceylon.

Little is known of the trade channels followed by the powders imported into the different countries, so that no information can be given as to the requirements of the markets and it would be inadvisable to encourage the cultivation of the papaya tree and the extension of the papain industry, although, in certain tropical regions, it might attain some degree of importance. Under present conditions, planters could be advised to take up papaya growing only if they were assured of a market for their products.

Distribution of the Sexes.

The papaya tree is generally described as being dioecious,† but this is not true of all varieties. The only question of interest for growers is the possibility of being able to determine the sex of the young plants, or of the seeds. There is at present no evidence that this can be done; there remains, therefore, only one method of eliminating the possibility of rearing too many useless male trees; namely, to put several plants in each hole when planting—four plants per hole is recommended.

Cultivated Varieties.

Papayas vary considerably in appearance, but it is observed that the habits of the trees, as well as the shape, colour and aroma of the fruit, are much influenced by the conditions under which they are grown; as for example, sun, temperature, humidity, aspect. There are also certain hereditary characteristics. As cross-fertilisation is not easily avoided there must always be undesirable types amongst the descendants of trees which are not isolated. Consequently, it is advisable to establish small and isolated plantations of superior trees, for the sole purpose of seed production.

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* Abstracted from an article by W. Bally in the *International Review of Agriculture* Year XXIV No. 11, November 1933.

† Having the male and female flowers on separate plants.

Establishment of a Plantation.

Papayas are generally reproduced by seed. Fresh seeds germinate in from 10 to 50 days; the rate of germination depending upon the degree of exposure to light. The best results are obtained if the seedbeds are exposed to the sun from 7 to 11.30 a.m. and shaded during the afternoon.

The seeds are sown in shallow trays or in the ground and carefully covered with a thin layer of sand. The plants should be transplanted at the end of three or four weeks. Another method of planting consists in placing from 4 to 6 seeds in a bamboo basket which, after germination has taken place, can be put in the final position in the field. It is advisable to cut off about 3 to 4 leaves before each transplantation, in order to avoid excessive transpiration. It appears that even plants which have attained a height of 2 metres may still be transplanted. It is possible, therefore, to replace male by female trees, even at an advanced age.

Many attempts have been made to reproduce papayas by vegetative methods. Though a certain measure of success has been attained in individual cases, the conclusion is reached that none of these methods has any practical value.

The usual spacing of trees is at a distance of about 7 feet each way.

The use of fertilisers is very generally recognised. The tree is most susceptible to potash and phosphate deficiency. It is important that careful research should precede manuring in order to determine the fertilizer requirements for the particular region.

Topping of trees has been advocated, but its advantages are uncertain.

There are certain advantages in intercalary crops. In British India tomatoes are chosen, but there are many other possibilities.

Opinions differ as to the age that a papaya plantation may attain. The yields of papain are most abundant during the first 3—4 years. It is advisable to replace the trees periodically so that the productive period of each tree never exceeds five years.

Diseases and Pests.

The diseases and pests by which the plant is attacked are not numerous and play an unimportant part. Papayas suffer from an excessively damp soil. The roots soon decay and the trees die shortly afterwards.

Papain and its Collection.

Papain is contained in the latex of the papaya. The characteristic properties of papaya latex were known as early as the 18th. century.

The latex tubes are found in all parts of the plant and the latex exudes whenever an incision is made; they are, however, most numerous in the outer skin of the fruit.

Many experiments have been carried out, from time to time, to discover the best methods of tapping the fruits. Earlier writers stated that the incisions

must be made with horn or ebonite knives and that the use of steel knives must especially be avoided as it tended to cause discoloration of the latex. These statements have been constantly repeated. The author, however, has tried steel knives and never observed any such discoloration of the latex. Preference should, in fact, be given to steel knives, as the edge is sharper and greater quantities of latex can thus be obtained. Pieces of broken glass can also be used. The latex can be collected in jars of aluminium, glass or porcelain.

The best results are always given by the first incision and, moreover, the papain coming from the first incision has the greatest proteolytic activity. Not more than four incisions should be made at a time on each fruit. Young fruits give small yields. The yields increase with the maturity of the fruit, attaining a maximum in fruits about three months old which have finished growing. All experiments indicate that the fruits should be tapped when at the age of 100 days and that two incisions should be made, returning every three days to the same fruit.

Preparation of Papain.

The most primitive process consists of spreading the latex on dishes and drying in the sun. The product so prepared will not have a satisfactory appearance; papain thus dried is brown or even blackish in colour.

Drying in furnaces, or in special sun-driers gives better results. The ideal preparation is, however, not obtained by these means for Hofstede has shewn in numerous experiments that drying *in vacuo* is the only method that makes it possible to obtain a product white in colour and with a proteolytic activity remaining intact even in alkaline media. For this reason in particular, prospective planters of papaya and manufacturers of papain are recommended to consult Hofstede's work.

Planters who intend to prepare their own product are accordingly advised to procure a plant for vacuum drying. A German model is described by the author, containing five shelves of 5 x 10 cm. spaced 6 cm. apart, by means of which about 2 kg. of dry papain can be prepared in about two hours only. The apparatus costs 2000 florins (Dutch) and to this must be added the cost of purchasing a dynamo for working the vacuum exhaust, amounting to about 500 florins; and further, there must be added the costs of packing and transport of the apparatus and the motor plant, including any customs charges, amounting to about 750 florins. This may seem a somewhat large outlay, but it guarantees the possibility of a regular supply of a product which, in practice, is certain to be appreciated by the purchasers.

The methods of papain purification are also described in the work of Hofstede; they are, however, too costly to be applied on the plantations and, as the crude papain always finds purchasers, the necessity for the manufacture of papayotine (refined papain) has not been experienced in tropical countries.

Yield.

Tapping of fruits may be begun ten to fourteen months after sowing. Lucrative yields can only be expected over a period of about three years. The different statements as to yield per tree or by acreage shew little correspondence. According to Hofstede's calculations, the yield per hectare amounts to 186 kg. in two and a half years if the trees are planted at distances of 4 m. x 4 m. apart, i.e. 625 trees per hectare, including 10 per cent. male plants; and to 300 kg. if the spacing employed is 3 m. x 3 m., or 1000 plants per hectare. The Principal of the Harcourt Butler Technological Institute at Cawnpore gives for the second season's tapping a yield of 28.7 lbs. per acre (32.1 kg. per ha.), and for another orchard 11.9 lbs. per acre (12.3 kg. per hectare), figures much lower than Hofstede's. The author estimates on the assumption of 250 trees per acre (617 trees per hectare) a production of 41.6 lbs. per acre, or 46.6 kg. per hectare.

Financial Return.

The price of papain on the New York market is taken as the basis of all calculations. In 1927 Ceylon papain was sold at 15.89 florins (Dutch) per kilo on the spot and it was as much as 17.40 florins in New York. The approximate range of prices in recent years, in shillings per lb. is as follows:—1925, 10 shillings; 1926, 18s.; 1927, 10s. 9d.; 1928, 16s.; beginning 1930, 7s. 6d.; end 1931, 10s. The latest quotation is given at 1.50 dollars to 1.60 dollars Gold per lb. (6.23 to 7.69 florins per kg.).

Hofstede has given estimates relating to an imaginary plantation of 13 hectares. On the assumption that such an undertaking may yield 2400 kg. of papain (which seems a generous estimate) and supposing that the factory possesses vacuum drying apparatus of improved type, Hofstede arrives at a cost price of 5.63 florins per kg. With the selling prices of 1927 there was thus a fair margin of profit. The profits resulting from the sale of fruits or products of the intercalary crops are not shewn on the balance sheet.

The estimates of the Cawnpore returns are of even more interest, since they are based on an actual example: a plantation of 2 acres which has been used as an experimental orchard. With the help of these data, compiled over three years, the author has established an estimate of the costs and profits of an imaginary plantation of 10 acres, carrying 250 trees to the acre. At the end of the second year the profit is 1216 rupees. In the total sum of the returns there figure:—(1) sale of the papain (416 lbs. at 12 rupees per lb.) producing 4992 rupees, (2) sale of the fruits, producing 3750 rupees.

The economic conditions in British India and Java are too diverse for comparison to be possible between these two estimates. It appears to be easy in Cawnpore to effect sale of the fruit; in Java there are difficulties, since the papaya is everywhere cultivated and there is always a great abundance of the fruit. In addition, in connexion with Cawnpore the sale of tomatoes is mentioned, producing 263 rupees in the first year of the trial plantation.

Uses of Papain.

In spite of increasing knowledge of papain, the number of purchasers remains limited. It appears that small consignments received regularly at Hamburg remain for some considerable time in the warehouses before finding purchasers. This is attributed to the fact that the proteolytic activity of papain is lower than that of the animal ferments. One authority in the trade states "Non-purified papain dissolves a quantity of albumin 200 times its own weight. Hence to digest 10,000 lbs. of albumin, 50 lbs. of papain would be required, while one lb. of pepsin is enough to produce the same effect, it should be added that the price of a lb. of papain is about 10s., while that of pepsin is about 2s."

On the other hand, reference may once more be made to the extent to which the importation of papain has developed in the United States. No information is available as to the uses in the United States, and hence all that can be done is to enumerate the various uses mentioned in publications consulted.

Reference is made to the use of the latex of the papaya for making tough meat tender. There would appear, however, to be limitations in this direction as it can only have this effect by direct contact.

Papain is used medicinally as a digestive to replace pepsin. Its use for this purpose, however, is limited by reason of comparative prices and also by the difficulty of obtaining papain in good condition which has preserved its full proteolytic activity.

Medicinally, papain has been employed in the combatting of cancer, diptheria and as a vermifuge.

Papain solutions have been used for reduction of fat and also as a substitute for rennet. It is certain that papain sometimes enters into the composition of chewing gum in America, which perhaps may be the explanation of the imports into the United States. It should be added that certain patent remedies contain papain and that it also enters into the composition of various milk flours.

The uses of papain are, in short, only very imperfectly known, but it is known that large quantities are imported into the United States of America.

Utilisation of the Fruit.

In certain cases the fruit may contribute something to the return from a plantation. The tapping of the fruit for the collection of the latex has no effect on the taste of the fruit.

The drying of the fruit has been suggested. It appears that the "flakes" thus prepared contain 10 per cent. of the moisture and 50 per cent. of the sugars and that vitamins of the ripe fruit are preserved if the drying is effected properly.

(Since the preparation of the above Abstract, our attention has been drawn to the latest number of the *Bulletin of the Imperial Institute,* Vol. XXXI, No. 4,

January 1934, in which there is a "Note on Preparation and Marketing of Papain." This article briefly states methods of tapping, yields, drying, packing, prices and grades of this product and gives a list of publications which deal with the subject.

It is stated that the price in December 1933 of average quality was 6s. 9d. per lb., and that oven-dried papain usually commands a premium of 3d. to 6d. per lb. over sun-dried.

The exports of papain from Ceylon in 1932 were 64,356 lbs. as compared with 76,947 lbs. in the previous year, 79,338 lbs. in 1930, 128,463 lbs. in 1929 and 125,684 lbs. in 1928. Of the 1932 exports, 45,575 lbs. went to the United States of America and 16,002 lbs. to the United Kingdom. The exports to the U.S.A. have steadily declined during the years under review; in 1928 they amounted to 111,877 lbs., while in 1932 they were 45,575 lbs. On the other hand, exports from Ceylon to the United Kingdom have slightly increased, being 11,054 in 1928 and 16,022 lbs. in 1932.—*Editor.*)

Reviews.

Present Position of Agriculture in the West Indies.

being a *"Report by Mr. F. A. Stockdale, C.M.G., C.B.E., Agricultural Adviser to the Secretary of State for the Colonies, on his Visit to the West Indies, 1933"*. 40 pp. Colonial Office, December 1933.

The title of this document is an insufficient statement of the subject matter. In his introductory paragraph the author states in reference to his tour—

> "An endeavour was made to acquire, so far as time permitted, a fair picture of the present position of agriculture in the West Indies and of the lines of development which were projected."

The Report is in fact, a concise review of the present position of agriculture in the West Indies.

Nearly half the Report records the matters dealt with by the West Indian Inter-Colonial Fruit and Vegetable Conference, 1933. As the findings of this Conference have been published in the March 1933 number of the *Malayan Agricultural Journal,* further comment in this place is unnecessary.

Reference is made to the West Indian Sea Island Cotton Conference 1933. This body decided on the formation of a West Indian Sea Island Cotton Association for the promotion and protection of the local cotton industry. The Association will be financed by a cess on lint exported. Further, the Conference allocated an agreed production of cotton in this area for the coming year in order to maintain prices by avoiding over-production.

The author also attended meetings of the Committee of the Central Cane-Breeding Station, Barbados. A brief review is given of the work of the Station and future possible developments are discussed.

A section of the Report is devoted to agricultural matters of special interest discussed in the course of the visit, from which one may gain an idea of the major problems affecting agricultural development, on which work is projected at the present time.

In conclusion, Mr. Stockdale states that sugar producers were reasonably optimistic in regard to the future and are obtaining increased production annually. Cocao producers generally were depressed and fear that unless conditions improve, forced sales of cacao properties are inevitable. Banana growers in Jamaica have suffered severely of late by reason of storms and floods, but knowing the recuperative powers of their Colony, are still optimistic in regard to the future; while an improvement in the Sea Island Cotton industry has aroused new hopes in the producers in those drier islands where this crop is the main stand by.

"The main problems which await solutions are those associated with the Panama disease of bananas in Jamaica and the witch-broom disease of cacao in Trinidad."

In view of the great importance of these crops to the Colonies in which they are grown, the need for scientific research, towards the solution of these problems, and unhampered by lack of finance, is emphasised.

D. H. G.

Banana Storage.

By C. W. Wardlaw and L. P. McGuire. H. M. Stationery Office, London. E.M.B. 72. 35 pp. 6 figs. Sept. 1933. Price 1s. net.

The investigation detailed in this interesting publication is a continuation of work prevously published by the same authors; *vide*, E.M.B. Reports Nos. 36 and 45. The present report is an account of recent investigations into the storage behaviour of several varieties of bananas, either well known in the West Indies or of hybrids evolved by the College Departments of Agriculture and Botany.

The Giant Governor, believed to be a tall mutant of the Dwarf or Cavendish variety, has given promising results in the course of four bulk storage trials. The bunches are lárger than the Cavendish, while the cylindrical shape and symmetry of the bunch and the relatively tough skin of the fruits render it suitable for naked bulk transport. The degree of ripeness for storage is discussed in addition to response to varying degrees of temperature in storage. Shipping trials have yet to be made and the results of such trials should be of great interest.

The Cavendish or Governor variety proved very subject to mechanical injury and is unsuitable for export.

Similar work on other varieties is detailed, as a result of which it can be stated that certain varieties are unsuited to storage, while further trial on other varieties would appear justified.

D. H. G.

Departmental.

FROM THE DISTRICTS.

The Weather.

Conditions during March were nearly normal in Kedah and Kelantan, though the rainfall was somewhat below the average and in the eastern State the second half of the month was hot and dry. There was an average or slightly deficient rainfall in Province Wellesley, most parts of Perak and the inland northern half of Selangor. Around Taiping, in the Dindings and Sitiawan, on Cameron Highlands, in the remainder of Selangor and in all the south of the Peninsula from Negri Sembilan to Singapore Island, the rainfall was much above average, being especially heavy in the first half of the month when floods occurred in Johore and Singapore Island.

Remarks on Crops.

Rubber.—There was again a rise in the average price of rubber during the month. The lowest and highest prices in dollars and cents per picul recorded for rubber from small holdings were:—Smoked Sheet $16.50 to $24; Unsmoked Sheet $12 to $22.50; Scrap $4 to $10. The average Singapore prices for these grades were respectively $22, $20.50 and $7.50 as compared with $20, $18.50 and $8.50 in February. Penang prices for Unsmoked Sheet ranged from $19 to $22.50 as compared with $15 to $20.50 in February.

The fairly general wet weather rendered wintering irregular and prolonged so that in many areas it did not terminate until the end of the month. In spite of the wintering season, tapping was maintained over an increasing area and in some localities with increased severity under the stimulus of the rise in price.

A better return for the product has, however, led to improvement in the upkeep of small holdings, interest in the preparation of good quality sheet, including better facilities for smoking it before sale to dealers, and to the more extended use of approved disinfectants for the control of bark diseases.

Leaf mildew caused by *Oidium Heveae* was definitely recorded in Kedah for the first time, though its presence had previously been suspected. This disease appeared fairly generally in Penang and Province Wellesley, Selangor, Negri Sembilan, and Malacca and in parts of Perak and Johore. Its incidence was, however, on the whole not severe, owing to the unusually wet weather prevalent in many infected areas. Only two or three estates had resort to treatment with sulphur dust. It was observed independently in Province Wellesley and Negri Sembilan that trees which had wintered early appeared to have escaped infection.

Padi.—The price of padi at the Government Rice Mill, Bagan Serai, remained at $1.40 per picul, although a privately owned mill was offering $1.10

to $1.20 per picul. The price in Kedah was equivalent to approximately 97 cents to $1.25 per picul, and in Province Wellesley to about $1.25 to $1.30 per picul. Elsewhere prices varied in the villages between 4½ and 10 cents per gantang, being as high as 15 cents in some inland localities in Selangor.

Harvesting was nearly completed in Kedah, Province Wellesley and Penang, Krian and Malacca. Records of yields so far obtained indicate that crops in all these areas will be good. The Kedah crop is expected to approximate closely to that of last year, while in Krian about 150,000 piculs, or some 8,800 tons, of padi have already been purchased by the Government Rice Mill.

As anticipated, the harvest in other parts of Perak has been prolonged, with the result that yields have been variable and loss has been occasioned by wet weather during the past month. The position is similar in the new padi area in Sabak Bernam District of Selangor.

Work in preparation for the coming season has been commenced in the inland Districts of Selangor, in Negri Sembilan, except Kuala Pilah District, and in parts of Western Pahang and Johore.

Coconuts and Copra.—The price of copra remained very low, showing little change from that of February, being on an average $2.30 per picul in Singapore. Prices elsewhere ranged from $1.40 to $3.30 per picul.

At the present price, copra production is hardly remunerative. Consequently, every opportunity is taken for sale of fresh nuts within the Peninsula and the local preparation of coconut oil as a village industry is increasing in some localities. It is reported from Johore that fresh unhusked nuts are being exported from Benut to China, the fibre being utilised there for rope-making and other purposes and the nuts being consumed.

Pineapples.—The supply of fruit increased during the month, but the peak supply for the season in Johore is not expected to be reached until April. Three factories were working in Singapore Island, seven in Johore and one in Selangor. Prices for fresh fruit in Johore were, first quality $2.80 and second quality $1.50 per hundred. Corresponding prices in Johore ranged from $2.00 to $2.20 and $1.40 to $1.50 delivered at the factory.

Legislation on the lines of the Colonial Ordinance to control and improve the industry was passed in Johore during the month.

In Selangor it was reported that some 420 acres had been newly planted with this crop.

Fruit.—A disease of durian trees in Penang Island was investigated. Its symptoms were very similar to those of Patch Canker of the rubber tree and the fungus *Phytophthora palmivora* (*faberi*), responsible for the disease of rubber trees, was found in the bark of the durians.

It is reported from Singapore that fresh lime fruits exported to England reached their destination in good condition and commanded high prices on the home market.

Vegetables.—Good crops of gourds, maize and tapioca were ripening on the temporary bunds of grass in Krian padi areas. Some headmen in South Krian are trying vegetable growing on the dry padi land itself. In Malacca, Chinese were growing vegetables on the padi land near markets after reaping the padi crop.

In Pahang west, the planting of food crops such as maize, tapioca and yams was in progress. This is becoming a regular annual practice just before the commencement of padi planting and is popular because it helps the peasants to supplement their food supply until the following padi harvest. The land used is not padi land and is generally held under temporary occupation licence.

Tobacco.—Prices for sun-dried tobacco leaves have ranged from $10 to $50 per picul according to quality in most parts of the country. In Malacca, a rise in price to about $35 per picul has led to renewed planting by Chinese on padi land. In Johore, interest in the crop has been well maintained with prices ranging from $30 to $80 per picul. In Singapore Island, prices have risen but supplies of leaf were scarce owing to successive floods in the chief tobacco growing areas.

Agricultural Stations.

Favourable weather conditions enabled progress to be made with planting programmes at all Stations, both in respect of permanent and annual crops.

The first stage of an experiment on the manuring of annual crops was concluded at the Selama Agricultural Station where it was found that plots on which a leguminous green manure had been turned in gave much better yields of gingelly than did those treated with non-legumes or grass. A parallel experiment at the Rembau Station gave very poor yields throughout.

An experiment on the manuring of ginger and turmeric was laid down at Selama, Cheras and Sungei Udang Stations.

At the Pineapple Experiment Station in Singapore a number of selected pineapple plants were planted out in rows from selections made at the Station itself and on an estate in the Island. Seeds from a number of selected pineapples were sown in the Solar propagator and some commenced to germinate. Tobacco planted early in the month was almost a complete failure owing to heavy rain.

Six more Light Sussex pullets were received from England at the Sungei Udang Station and six local hens for cross breeding with the White Wyandottes were obtained for the Pineapple Station in Singapore. Yields of eggs at the Tanah Rata Experiment Station from the pure bred imported fowls continued to be satisfactory; the six Rhode Island Red pullets gave 123 eggs, each weighing over 2 ozs., during the month.

Padi Stations and Test Plots.

With three exceptions, harvest was finished, or almost finished, on all Padi Test Stations and Plots at the end of the month.

Results from the majority of the Stations and Plots were under examination in the Head Office. Siam 29 has again shown itself a high-yielding strain readily adaptable to conditions in many different parts of the country, in all of which it has done well. Its main defect is a rather weak straw. Mayang Ebos 203 has also done well at several of the northern Stations and Plots.

Work for the coming season has already been commenced on the two inland Test Plots in Selangor, the Jelebu Plot in Negri Sembilan and the Temerloh Plot in Pahang.

On the Kuang Plot in Selangor, the short term varieties of padi, planted between seasons, were ripening, but much of the grain was empty owing to damage by birds and possibly to unfavourable weather conditions.

Vegetable beds have been prepared and planted for inter-season trials on Bukit Merah Test Station in Province Wellesley and Kendong Padi Test Plot in Negri Sembilan.

A small supply of mushrooms was obtained from the bed of padi straw established at the Sungei Udang Test Plot adjoining the Agricultural Station in Malacca.

Rural Lecture Caravan.

The Caravan visited Kuala Langat District of Selangor from March 6th. to 15th., when lectures illustrated by lantern slides, models, photographs and specimens were given on poultry husbandry, the preparation of improved copra and coffee.

From March 16th. to 25th., five centres in the Seremban District of Negri Sembilan were visited, the subjects dealt with being poultry husbandry and treatment of mouldy rot disease of rubber.

Malayan Padi Competition.

Local competitions were held at 16 centres in Negri Sembilan during the month, the total entries aggregating 776. From among these, a limited number were selected for forwarding to the Malayan Exhibition to be held in Kuala Lumpur at the beginning of June. Exhibits from the large padi-growing area in Rembau sub-District were disappointing both in numbers and in quality. Exhibits at each centre were criticised, owners were informed of faults and the exhibition standards were explained.

DEPARTMENTAL NOTES.

Retirement of Dr. Jack.

Dr. H. W. Jack, Economic Botanist, has been granted full-pay leave for 3 months, 25 days from 31st March to 25th July, 1934, on abolition of office.

Dr. Jack joined this Department in May 1914, as Assistant Agricultural Inspector. In the following year he was transferred to instructional activities and in 1919 was appointed Economic Botanist.

His activities in the Department have been concerned with a number of crops, but his research work on padi is the best known and attracted attention beyond the confines of this country. His services in this direction received recognition by the confirment on him in 1930 of Membership of the Order of the British Empire.

His reputation on the field of sport is no less well known, both locally and in Europe. On two occasions he was a member of the Irish International Rugby football team and was for many years a prominent member of the Selangor Rugby team.

Dr. Jack will, in July, assume duty as Director of Agriculture, Fiji. His colleagues in this Department wish him every success in his new appointment.

Rural Lecture Caravan.

Experience gained in the past led to the suggestion that tours of the Rural Lecture Caravan would be more effective in conveying instruction if the Caravan were to remain in each centre visited for two days instead of one. In order to give in one day both a display of films teaching general lessons and lectures conveying more detailed information on special subjects, it was necessary to commence the lectures at about 4.30 in the afternoon, then to make a break of about two hours and commence displaying the films at 7.30 p.m. There were two main objections to this procedure. The time for the lectures and the break in the programme were found to be inconvenient to the audience, and the programme itself was so long that it was difficult to assimilate.

Consequently, it was decided to try the effect of spreading the programme over two days in each centre, the films being displayed on the first evening after dark, and lectures illustrated by models and lantern slides being given on the second evening. It was further decided to confine the lectures to not more than two subjects, each occupying about 20 minutes, and to allow an interval after each lecture for discussion and for examination of models and exhibits. The tables on which the latter were displayed were provided with electric lights supplied from the generator which could be switched over to the film projector or the lantern when the lights were not required.

A trial tour conducted in Kuala Selangor on these lines at the end of 1933 proved successful. In consequecne, this procedure has been adopted for all tours during the present year.

The agricultural subjects on which attention is mainly being concentrated are Poultry Husbandry, Preparation of Improved Copra, and Potential Money Crops for Small Holders. Three lectures on Poultry Husbandry have been prepared. These deal with housing, management of birds and feeding and sanitation. They are illustrated by means of models of houses and pens, protected feeding troughs and drinking troughs, all made of materials readily available to dwellers in the villages.

The lecture on the Preparation of Improved Copra gives details of the construction of a good type of simple kiln and of its correct use. Models of good and bad kilns are provided and also a set of lantern slides.

Money crops for small holders include such crops as tobacco, groundnuts, gingelly and fruit trees such as the Brazil nut and the avocado pear. Each of these is dealt with quite shortly and in a general manner, with photographs and specimens as illustrations, the object being to draw the attention of the audience to the possibilities of each, leaving details of planting and cultivation to be given to those interested by the local Agricultural Officers in the course of their regular duties.

Copra Investigations.

A separate Division of the Research Branch of the Department has been created to deal with Copra investigations. The Division will be under Mr. F. C. Cooke, A.R.C.S., B.SC., A.M.I. CHEM. E., Assistant Chemist for Copra Investigations, whose title in future will be styled Officer-in-Charge, Copra Investigations.

The reorganisation will date from 1st. May, 1934.

Leave.

Mr. W. N. C. Belgrave, Chief Research Officer, returned from leave on 4th. March, 1934.

Mr. G. H. Corbett, Government Entomologist, returned from leave on 29th. March, 1934.

Statistical.

MARKET PRICES.

March 1934.

Rubber.—The market price of rubber fluctuated during the month, opening at 16¼ cents per lb. for Spot loose in Singapore and closing at 17 cents per lb. The highest quotation was on the 16th of the month when the price reached 18⅜ cents per lb. The average price for the month was 17⅛ cents per lb. in Singapore, 5⅛ pence in London and 10⅞ cents gold in New York, as compared with 16¼ cents, 4⅞ pence and 10¼ cents gold respectively in February.

Weekly prices during March for small-holders' rubber at Kuala Pilah, Negri Sembilan; Kuala Kangsar, Perak, and Batu Pahat, Johore, were as shewn in the following table :—

Grades	VALUE PER PICUL (dollars)								
	Kuala Pilah, Negri Sembilan.		Kuala Kangsar, Perak.			Batu Pahat Johore.			
	1.3.34	15.3.34	7.3.34	21.3.34	28.3.34	7.3.34	14.3.34	21.3.34	28.3.34
Smoked sheet	19.73					19.23	21.80	20.47	20.30
Unsmoked sheet	19.05	20.32						18.00	19.30
Rubber*			16.16	18.87	16.74				
Scrap		5.97							

* Wet unsmoked sheet.

Transport by lorry Kuala Pilah to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

Palm Oil.—The course of the market Liverpool/Continent during March on a basis of 5 per cent. f.f.a., c.i.f. was as follows: March 7th. £14.10.0 per ton net, March 14th. £13.15.0 per ton net, March 21st. £13.10.0 per ton net, and March 28th. £13.10.0 per ton net.

Prices in the U.S.A. landed weight per pound in bulk c.i.f. New York/Philadelphia were 2.75 cents gold on the 7th March, 2.62 cents gold on the 14th. March, 2.60 cents gold on the 21st. March, and 2.55 cents gold on the 28th. March.

The price of palm kernels Fair Average Malayan Quality c.i.f. landed weight on the Continent was shillings 7 per cwt. on March 7th., shillings 6/9 per cwt. on March 14th., shillings 6/6 per cwt. on March 21st., and shillings 6/3 per cwt. on March 28th.

Copra.—The price of copra fell during March. The highest Singapore price for Sundried during the month was $3 per picul, and the lowest price $2.65 per picul, the average price being $2.90 per picul as compared with $3 during February. The mixed quality averaged $2.31 per picul as compared with $2.40 per picul in February.

Coffee.—The price at Singapore for Sourabaya coffee remained fairly steady; prices ranged according to grade, from $20.75 to $21.50 per picul. Palembang coffee averaged $16.20 per picul during the month, being quoted at $16.75 per picul on the 2nd. and $16 per picul on the 30th. of the month; the average figure for February was $17.19 per picul.

Arecanuts.—There were no sales of Palembangs, Bila Whole or Kelantan in February, there being no stocks on the market. The range of Singapore prices for other grades were, Splits $7 to $11.50 per picul; Red Whole $2.30 to $5.90 per picul and Sliced $2.75 to $4.25 per picul.

Rice.—The average wholesale price of Siam No. 2 ordinary rice per picul in Singapore in February was $3.06, as compared with $2.91 in January. No. 1 Rangoon rice averaged $2.50 per picul in February as compared with $2.72 in January. Saigon No. 1 (long grain) averaged $2.60 per picul in February as compared with $2.65 per picul in January.

Tea.—During February, the average price quoted in London for Malayan tea was shillings 1/0.87 per lb. Average prices during February for tea consignments from other countries were as follows:—Ceylon shillings 1/3.75 per lb., Java shillings 1/0.71 per lb., Indian Northern, shillings 1/2.75 per lb. and Indian Southern, shillings 1/2.76 per lb.

Gambier.—The price of Block gambier remained steady during the month, averaging $4.19 per picul, Cube No. 1 averaged $6.69. Corresponding figures for February were $3.88 and $6.38 respectively.

Pineapples.—There was a slight fall in values during March, the average Singapore price per case being as follows:—Cubes $3.12, Sliced Flat $2.98 and Sliced Tall $3.06, as compared with $3.24, $3.06 and $3.19 respectively during February.

Tapioca.—The price of Flake Fair averaged $4.70 per picul as compared with $5.11 per picul in February. Pearl Seed averaged $5.80 per picul and Pearl Medium $6.38 per picul, both prices being similar to the average prices during February, namely $5.88 and $6.38 respectively.

Sago.—Pearl-Small Fair decreased slightly in price during March, averaging $3.65 per picul for the month; the average price was $3.76 per picul in February. Flour-Sarawak Fair averaged $1.87½ per picul as compared with the February average of $1.95 per picul.

Mace.—Prices were nominal during March, the average for the month for Siouw being $65 per picul, and for Amboina $40 per picul.

Nutmegs.—110's averaged in price during March $24.25 per picul, as compared with $21.25 per picul in February; 80's also increased in value, averaging $26.75 per picul against the figure of $24.25 per picul in February.

Pepper.—Average Singapore prices during March were as follows:—Singapore Black $15.69 per picul; Singapore White $29.88 per picul and Muntok White $30.75 per picul; the corresponding figures for February were $15.50, $29.12 and $30.50 per picul respectively.

Cloves.—Prices continued steady and nominal as in the previous month; Zanzibar averaged $35 per picul and Amboina $45 per picul.

Tuba Root.—There was a scarcity of supplies during March, the prices being nominal and similar to last month's averages, namely $25 to $30.50 per picul.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co., Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Mackay & Co., Singapore.

1 picul = 133 1/3 lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY.*

February 1934

Malaya.—Gross foreign imports of rice (including stocks available for re-export) during February 1934, amounted to 41,623 tons, as compared with 46,275 tons in February 1933, of which 40 per cent. were consigned to Singapore, 24 per cent. to Penang, 7 per cent. to Malacca, 27 per cent. to the Federated Malay States and 2 per cent. to the Unfederated Malay States.

Of these imports, 57 per cent. were from Siam, 39 per cent. from Burma, 3 per cent. from Indo-China and 1 per cent. from other countries.

Total foreign exports of rice from Malaya in February 1934 were 9,576 tons (including 174 tons local production) as compared with 13,975 tons in February 1933.

Of these exports 68 per cent. were consigned to Netherlands India and 32 per cent. to other countries.

Net imports for the period January to February 1934, were 66,902 tons as compared with 67,152 tons during the same period for 1933, a fall of .4 per cent.

India and Burma.—Total foreign exports of rice during January 1934, were 77,000 tons as compared with 74,000 tons in December 1933 and 68,000 tons in January 1933, an increase of 4 per cent. in respect of the previous month and an increase of .13 per cent. in respect of the same period in the previous year.

The total area under rice (1933-1934) as reported in the Indian Trade Journal dated 1st March, 1934, was 81,977,000 acres as compared with 82,661,000 acres in the previous year, a decrease of .8 per cent. The total yield is estimated at 30,353,000 tons of cleaned rice as compared with 31,089,000 in 1932-1933, a decrease of 2.4 per cent.

Japan.—The production of rice in Japan (Proper) during 1933 amounted to 9,936,484 tons as compared with 8,469,859 tons the previous year or an increase of 17.3 per cent. The increase is due to considerable improvement of agricultural technique and continued favourable weather conditions.

The balance of stock of rice in Japan (Proper) on October 31st, 1934, after deducting requirements for export and consumption is estimated at 2,637,700 tons.

Imports of Korean and Formosan rice into Japan (Proper) were:

		1st Nov. 1933 to 20th Jan. 1934 tons.	1st Nov. 1932 to 20th Jan. 1933 tons.
Korea	...	338,429	385,835
Formosa	...	149,509	198,036

* Abridged from the Rice Summary for February 1934, compiled by the Department of Statistics, S.S. and F.M.S.

Siam.—Exports of rice from Bangkok (approximate) during February 1934, amounted to 140,961 tons as compared with 144,428 tons in February 1933, a decrease of 2 per cent.

According to the Second Forecast (1933-1934) the area planted at the end of December 1933, amounted to 7,638,000 acres as compared with 7,576,000 acres the previous year, an increase of .8 per cent. The total outturn is estimated at 2,969,000 tons of rice and the surplus available for export at 1,346,000 tons.

Note: The figures for 1934, are approximate.

Netherlands India, Java and Madura.—No further information to that published in the Summary for the month of December, 1933, is available.

French Indo-China.—Exports of rice from Saigon for the period January and February 1934, totalled 206,000 tons, an increase of 18,000 tons or 9.6 per cent. as compared with the corresponding period of 1933.

Ceylon.—Imports for the month of January 1934, totalled 44,939 tons, an increase of 8,527 tons on the imports for the same perood of 1933.

Of these imports 16 per cent. were from British India, 67 per cent. from Burma and 17 per cent. from other countries.

Europe and America:—Quantities of rice shipped from the East were:—

(*a*) To Europe for the period January 1st to February 15th 1934, 57,401 tons, a fall of 67,570 tons or 54 per cent. as compared with the same period of 1933. Of these shipments, 11 per cent. were from Burma, nil from Japan, 74 per cent. from Saigon, 12 per cent. from Siam and 3 per cent. from Bengal, as compared with 30 per cent. from Burma, 13 per cent. from Japan, 50 per cent. from Saigon, 6 per cent. from Siam and 1 per cent. from Bengal in 1933.

(*b*) To the Levant, period January 1st to January 17th 1934, 123 tons an increase of 87 tons or 242 per cent. as compared with the same period of 1933.

(*c*) To America and the West Indies for the period January 1st to January 22nd 1934, 49 tons an increase of 49 per cent. as compared with the same period of 1933.

MALAYAN AGRICULTURAL EXPORTS, FEBRUARY, 1934.

PRODUCT.	Net Export in Tons.				
	Year 1933.	Jan.-Feb. 1933.	Jan.-Feb. 1934.	February 1933.	February 1934.
Arecanuts ...	20,756	4,533	7,444	2,126	3,832
Coconuts, fresh ...	100,609†	16,154†	14,544†	9,139†	8,029†
Coconut oil ...	17,568	2,960	3,867	1,342	2,104
Copra ...	110,543	18,991	17,054	4,407	7,791
Gambier, all kinds ...	2,560	394	328	213	155
Palm kernels ...	1,983	199	346	134	186
Palm oil ...	12,101	562	1,664	157	1,367
Pineapples canned ...	59,582	9,025	8,832	4,312	4,165
Rubber ...	459,836§	67,388§	83,605	31,559§	41,832
Sago,—flour ...	7,648	1,369	1,088	713	437*
„ —pearl ...	2,646	348	475	219	220
„ —raw ...	4,420*	767*	768*	272*	304*
Tapioca,—flake ...	9,881	1,915	1,179	965	530
„ —flour ...	702*	364	213§	49	29*
„ —pearl ...	17,297	2,418	2,333	1,362	1,234
Tuba root ...	569½	43	106½	39	62

† hundreds in number. * net imports. § production.

NETHERLANDS INDIA RUBBER STATISTICS.

Acreage of Tappable Rubber not tapped at the end of January, 1934.

January 1934	A		B		C	
	Totally ceased		Partly ceased		Total A & B	
	Number of Estates	Area in Acres	Number of Estates	Area in Acres	Number of Estates	Area in Acres
Java ...	65	21,044	73	20,516	138	41,560
Outer Provinces ...	176	52,236	82	51,781	258	104,017
Netherlands India ...	241	73,280	155	72,297	396	145,577

The above acreages are converted from hectares, at 2.47 acres.

The total area out of tapping for January, 1934, amounts to 14.9 per cent. of the total tappable area at end of December, 1932.

MALAYA RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING FEBRUARY, 1934.

State or Territory	Acreage of Tappable Rubber end 1932 (d)	Estates which have entirely ceased tapping: Acreage	Estates which have entirely ceased tapping: Percentage of (3) to (2)	Estates which have partly ceased tapping: Acreage	Estates which have partly ceased tapping: Percentage of (5) to (2)	Area of Tappable Rubber never been tapped: Acreage	Area of Tappable Rubber never been tapped: Percentage of (7) to (2)	Total (3) + (5)	Percentage of (9) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STRAITS SETTLEMENTS :—									
Province Wellesley	44,734	1,323	2.9	7,302	16.3	1,082	2.4	8,625	19.2
Dindings	6,,969	209	3.0	865	12.4	546	7.8	1,074	15.4
Malacca	111,780	4,740	4.2	15,933	14.2	7,316	6.5	20,673	18.4
Penang Island	1,635	365	22.3	82	5.0	170	10.4	447	27.3
Singapore Island	28,269	8,021	28.3	4,743	16.8	248	0.9	12,764	45.1
Total S.S. ...	193,387	14,658	7.6	28,925	14.9	9,362	4.8	43,583	22.5
FEDERATED MALAY STATES :—									
Perak	250,951	3,991	1.6	27,715	11.1	14,225	5.7	31,706	12.6
Selangor	308,379	1,924	.6	36,479	11.8	12,564	4.1	38,403	12.4
Negri Sembilan	228,541	5,125	2.2	21,430	9.4	15,976	7.0	26,555	11.6
Pahang	38,141	5,227	13.7	5,207	13.6	5,086	13.3	10,434	27.3
Total F.M.S. ...	826,012	16,267	1.9	90,831	11.0	47,851	5.8	107,098	12.9
UNFEDERATED MALAY STATES :—									
Johore	325.747	20,794	6.4	32,442	10.0	21,470	6.6	53,236	16.3
Kedah (a) (b)	126,588	3,595	2.8	9,556	7.6	(e) 5,700	4.5	13,151	10.3
Kelantan	21,175	5,749	27.1	2,200	10.4	1,860	8.8	7,949	37.5
Trengganu (c)	4,395	Nil	Nil	1,561	35.5	Nil	Nil	1,561	35.5
Perlis (a) (b)	957	106	11.1	131	13.7	308	32.2	237	24.8
Total U.M.S. ...	478,862	30,244	6.3	45,890	9.6	29,338	6.1	76,134	15.9
TOTAL MALAYA ...	1,498,261	61,619	4.1	165,646	11.0	86,551	5.8	226,815	15.1

Notes:—(a) Registered companies only and are rendered quarterly.
(b) The figures quoted for Kedah and Perlis are those for end December 1933, and Kelantan end January, 1934 Revised figures will be published when available.
(c) Registered Companies only.
(d) Figures for end December 1933, are not yet available.
(e) Estimated: figures not yet available.

MALAYA RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF FEBRUARY 1934 IN DRY TONS.

Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
	Ports	Dealers	Estates of 100 acres and over	during the month	January and Feb. 1934	during the month	January and Feb. 1934	during the month: Foreign	during the month: From Malay States & Labuan	January and February 1934: Foreign	January and February 1934: From Malay States & Labuan	during the month: Foreign	during the month: Local	January and February 1934: Foreign	January and February 1934: Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States ...	...	12,267	12,309	11,163	23,504	11,175	20,938	Nil	Nil	Nil	Nil	17,384	2,680	31,831	11,189	...	15,490	11,345
Johore ...	...	3,362	3,024	4,029	7,273	5,168	9,731	Nil	4	Nil	10	1,399	6,959	3,209	13,063	...	3,935	3,294
Kedah ...	...	406	2,487	2,766	5,892	1,632	3,599	Nil	Nil	Nil	Nil	1,668	2,887	2,899	6,688	...	384	2,352
Perlis ...	...	24	9	8	29	34	68	Nil	Nil	Nil	Nil	Nil	38	Nil	103	...	22	15
Kelantan ...	...	393	195	294	484	749	1,684	13	Nil	121	Nil	92	909	146	1,918	...	382	261
Trengganu ...	...	55	50	198	398	98	197	Nil	Nil	Nil	Nil	Nil	296	Nil	595	..	55	50
Total Malay States	...	16,507	18,074	18,458	37,580	18,856	36,217	13	4	121	10	20,543	13,769	38,085	33,556	...	20,268	17,317
STRAITS SETTLEMENTS :-																		
Malacca ...	...	2,649	1,220	1,376	2,698			Nil		1		3,284		7,522		...	3,427	1,182
Province Wellesley	...	1,029	692	525	1,155			Nil		Nil						...	926	543
Dindings ...	...	70	139	104	219	2,325	5,372	Nil	16,198	Nil	33,280	8,913	Nil	17,046	Nil	...	58	152
Penang ...	2,939	6,536	13	9	29			1,742		3,677						3,116	5,877	9
Singapore ...	6,159	32,045	143	179	335			13,074		27,158		25,127		50,269		4,961	34,215	159
Total Straits Settlements	9,098	42,329	2,207	2,193	4,436	2,325	5,372	14,816	16,198	30,836	33,280	37,324	Nil	74,837	Nil	8,077	44,503	2,045
TOTAL MALAYA	9,098	58,836	20,281	20,651	42,016	21,181	41,589	14,829	16,202	30,957	33,290	57,867	13,769	112,922	33,556	8,077	64,771	19,362

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
20	21	22	23	24	25	26
DRY RUBBER	11.625	29.396	4.912	3.626	1.733	115
WET RUBBER	3.865	4.819	965	785	2.202	269
TOTAL ...	15.490	34.215	5.877	4.411	3.935	384

TABLE III
FOREIGN EXPORTS

PORTS	For month	January and Feb. 1934
Singapore ...	35.097	71.619
Penang ...	14.570	26.756
Port Swettenham.	7.479	13.030
Malacca ...	721	1.517
MALAYA ...	57.867	112.922

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January and Feb. 1934
Malay States ... / Straits Settlements	42.389	82.496
MALAYA ...	42.389	82.466

Notes :—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + 15 tons local consumption during the month —[2]—[3]—[4]—[5]—[9]—[10]. For the Straits Settlements, Columns [9] and [10] represent purchases by dealers from local estates of less than 100 acres, reduced by 15 % to terms of dry rubber.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15%; wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.

4. Domestic exports are estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign exports of the later month, the foreign exports of the Malay States being domestic production.

5 The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 23rd March 1934.

Locality	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total	Total	Most in a day Amt.	Number of days: Precipitation .01 in or more	Precipitation .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total	Daily Mean	Per cent
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.								
Railway Hill, Kuala Lumpur, Selangor ...	91.1	70.9	81.0	95	68	85	72	83.3	83.8	8.84	224.5	3.27	14	12	1	1		152.65	5.45	45
Bukit Jeram, Selangor ...	88.2	71.7	79.9	91	70	81	73	85.3	85.5	0.38	9.7	0.23	6	2				162.55	5.80	48
Sitiawan, Perak ...	87.6	71.0	79.3	91	68	79	74	82.7	83.5	4.49	114.1	1.18	12	10	1			175.40	6.26	52
Temerloh, Pahang ...	85.5	70.9	78.2	91	68	74	73	81.3	83.1	1.94	49.3	0.51	9	8				128.40	4.59	38
Kuala Lipis, Pahang ...	84.4	69.8	77.1	90	67	72	72	80.9	82.0	6.17	156.7	1.50	16	14	2	15		107.75	3.85	32
Kuala Pahang, Pahang ...	82.1	73.3	77.7	86	67	76	77	80.5	81.5	8.93	226.8	3.69	13	11				131.40	4.69	39
Mount Faber, Singapore ...	84.7	70.8	77.7	89	69	73	73	78.7	79.3	6.07	154.2	1.90	15	13	3	1		157.80	5.64	47
Butterworth, Province Wellesley ...	86.6	71.8	79.2	91	69	79	75	83.1	84.2	2.14	54.4	0.68	10	7				181.95	6.50	55
Bukit China. Malacca ...	85.8	72.0	78.9	90	69	81	74	81.2	81.6	3.79	96.3	3.05	7	7	1			171.10	6.11	50
Kluang, Johore ...	85.1	70.3	77.7	91	66	73	72	78.3	79.2	7.97	202.5	2.17	14	13	1	2		154.60	5.52	46
Bukit Lalang, Mersing, Johore	81.3	71.5	76.4	85	67	75	75	77.6	78.3	9.57	243.1	3.74	14	10	1					
Alor Star, Kedah ...	88.6	69.6	79.1	93	64	81	73	81.7	83.3	1.41	35.8	0.68	7	6	4	2		169.85	6.07	51
Kota Bahru, Kelantan ...	83.6	70.9	77.3	89	65	77	74	79.5	81.4	6.70	170.2	2.11	16	10				142.00	5.07	43
Kuala Trengganu, Trengganu	82.9	70.6	76.7	87	65	77	74	79.4	80.4	5.80	147.8	1.30	14	10	1			143.80	5.14	43
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. Pahang ...	69.7	59.9	64.8	80	58	62	63	69.0	69.4	4.27	108.5	0.80	19	15	5	15		78.25	2.79	23
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	70.3	55.1	62.7	73	46	64	61	67.5	68.3	6.19	157.2	2.52	12	9		2	1	105.85	3.78	31
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ..	69.9	57.3	63.6	74	53	63	60			6.43	163.3	3.24	11	10		1	1	107.40	3.84	32

Compiled from Returns supplied by the Meteorological Branch, Malaya

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THE

Malayan Agricultural Journal.

MAY, 1934.

EDITORIAL.

Dairy Farming in Malaya.

The policy in many countries to-day is to encourage local production instead of relying on imports of staple commodities. This policy is largely dictated by the present international currency difficulties and the tariff barriers erected by the Governments of most countries. Whereas, in the past, nations have relied on a favourable trade balance, such a view has been partly superseded by local production for internal consumption with the object of rendering the country more self-supporting at least in the provision of foodstuffs.

The widespread new policy finds its advocates and opponents amongst the economists, but without entering into the discussion of such a controversial subject, we desire briefly to state the position in Malaya in relation to dairy farming. Normally, the value of the net imports of milk and butter into Malaya exceeds $10,000,000 annually. With the lower values of our important export products, any diminution of this large bill for imported dairy products is desirable.

We would remark, however, that the experimental work of the Department of Agriculture into dairy-farming problems was inaugurated some eight years ago, at a time when local production to replace imports was less the accepted principle than it appears to be to-day. While even at that time, local production was held to be a virtue in itself, there were other and more convincing reasons which rendered desirable the improvement of dairy farming in Malaya.

In the first place, there existed a considerable, though very scattered, dairy industry throughout the country, and Indian-owned herds of cattle still exist near almost every centre of population. The produce was sold almost entirely to Asiatics.

Secondly, the stock from which this milk was obtained was generally inferior. It was therefore desirable that investigations should be put in hand with the object ultimately of improving the yield and quality of the milk. These investigations have necessitated consideration of such problems as breeding and cross-breeding suitable animals and feeding.

Thirdly,—and perhaps most important—the investigation of this subject has as its object the desirability of marketing fresh, pure and rich milk. The great advantage of the imported milk is its purity. This fact was the reason

for justified reluctance of the public to purchase locally-produced milk which might possibly be obtained from unhealthy stock kept under unhygienic conditions. Unless locally-produced milk can be guaranteed rich and pure, the public are well advised to continue to consume the imported product. On the other hand, if milk of guaranteed purity can be produced in Malaya, experience shows that it will be in demand.

The work at Serdang, which is described in this number, demonstrates that very real progress has been made. We are able to market a rich milk of guaranteed purity, and to maintain the supply throughout the year. The investigations are, of course, still in progress and it must be some years before anything approaching finality with regard to the most desirable type of animal can be claimed. Breeding trials, in particular, are incapable of early conclusion. The results to date, however, are extremely encouraging and we appear to be advancing to a stage where the up-grading of local stock can be taken in hand with confidence.

Controlled Drainage and Irrigation.

With the object of adding considerably to the acreage available for padi planting in Malaya, the Department of Drainage and Irrigation is carrying out work on schemes to provide several areas with a controlled water supply either by means of irrigation or by systems of controlled drainage. Among the most important of these areas is that in the mukim of Panchang Bedina in the Sub-District of Sabak Bernam, Selangor, where a system of controlled drainage is under construction which will render 15,000 acres of land available for padi cultivation.

In an interesting article in this number Mr. Miller, Drainage and Irrigation Engineer, Telok Anson, gives an account of the engineering work in progress.

In connexion with this article, we take the opportunity of adding some particulars of the agricultural side of the work.

As soon as it became known that work on the drainage scheme was about to be commenced, a number of applications for land in the area affected were received. Most of the land first taken up was situated on either side of the main drainage channel, but the demand for land soon outstripped the rate of progress of the work. Consequently, the blocks on which jungle was felled with a view to planting padi were scattered, resulting in difficulties of pest control.

Felling, burning and clearing were carried on under difficulties, since the land was wet and the numerous clumps of nibong palm offered serious obstacles to clearing. These difficulties are clearly shown in Mr. Miller's article.

To meet the demand for seed padi, the Department of Agriculture imported from Krian and other parts of the Peninsula some 10,000 gantangs of which 4,000 gantangs were seed of suitable pure strains and the remainder seed of mixed padi.

At the same time, the Department selected, felled, burned and cleared sites for two Padi Test Plots, one of about 6 acres on the main canal and another of about 4 acres at Sungei Haji Durani further inside the area.

These plots and much of the felled area were successfully planted in the latter half of 1932, but difficulties arising from damage to nurseries by rats had to be overcome.

Subsequently, rats appeared in large numbers and wrought havoc among the standing crop which was also attacked by stem borers. The prevalence of jungle stumps, especially nibong, and unburnt tree trunks on the land render measures for the control of rats very difficult, since they afforded excellent shelter for the pest. As a result, the initial crop obtained from this area was very small.

During the year 1933 further areas of jungle were felled and the work of clearing the land planted in the previous season was continued. The result has been that some 5,500 acres were planted with padi for the season 1933-34. After a somewhat late start, due to drought, growth was good. Rats appeared suddenly in large numbers early in 1934, but vigorous control measures were carried out successfully under the supervision of the administrative and agricultural officers. The crop now being reaped bids fair to give fairly satisfactory returns.

In addition to establishing the two Padi Test Plots, the Department of Agriculture has stationed a Malay Agricultural Subordinate in the Sub-District to give advice on padi work, and the appointment of a second officer is contemplated. The plots will serve to determine which pure strains of padi are best suited to local conditions and to demonstrate their value, and it is hoped to ensure that the area will soon be planted throughout with two or three pure strains giving good yields of grain of uniform size and ripening evenly over the whole area. Even ripening reduces damage by pests, especially birds, and uniformity of grain is an important factor in the production of rice of good quality when the padi is milled.

The probable future need for milling facilities in this extensive and somewhat remote area has not been overlooked. Attention has already been given to the selection of a suitable type of mill and steps have been taken to provide funds for its estimated cost.

The development of this large area of padi land will prove a valuable permanent addition to the cultivated land of this country and will be an important local source of production of rice.

THE GOVERNMENT DAIRY FARM, SERDANG

BY

B. Bunting,

Agriculturist

and

T. D. Marsh,

Assistant Agriculturist.

Introductory.

The Government Stock Farm at Serdang is a branch of the Central Experiment Station, Serdang and is administered by the Officers in charge of the Station. It was commenced in 1926, principally with the object of carrying out research on methods of improvement of milch cattle of Malaya, but also of providing a supply of high-grade milk to Government Hospitals and to the general public.

The present article describes some of the problems connected with such a project, the various investigations now in progress, and the results so far obtained.

There is no indigenous domesticated breed of cattle in Malaya, the stock at present in the country consisting mostly of direct importations of cattle for draught and beef purposes, or the progeny of such animals.

The Indian dairymen, in or near the towns in Malaya, have made a few sporadic importations of milch cattle of various Northern Indian breeds, which are reputed to be better milk yielders than some of the Southern Indian breeds. In addition, a few Australian grade cattle of European breeds have been imported at various times by them; generally speaking, however, the introductions have been of the wrong type for dairy purposes and, in consequence, the milk yield of Malayan cows is exceptionally low.

In fact, the methods of animal husbandry generally practised by the average Indian dairyman tend to cause the degeneration rather than the improvement of livestock and, apart from work in the Government Institutions, very little effort has been made to improve the local milch cow.

Breeding Policy.—The principal objects in establishing a stock farm at Serdang were briefly, as follows:—

(1) The maintenance of a herd of pure-bred Montgomery cattle, from which, by continuous selection and up-grading, an improved strain of animal could eventually be produced with a view to:—

- (*a*) the production of a supply of high-grade fresh milk for Government Hospitals and the general public,
- (*b*) the distribution of high-class bulls for stud purposes,
- (*c*) the production of draught animals from surplus bulls.

(2) The introduction of high-class Friesian bulls for cross-breeding with the Montgomery cows.

(3) The determination whether imported Friesian stock can be acclimatised on the plains in Malaya with a view to establishing a small herd of pure-bred animals to provide a supply of stud bulls for crossing purposes.

The Montgomery breed was selected for trial as being the most likely to meet local requirements, that is, the production of milk and draught animals. According to reports, this breed has, during recent times, been selected for milk production to a far greater extent than any other in India and has been used for many years as the foundation stock for cross-breeding experiments both by Military Farms and the workers of the Agricultural Research Stations in many parts of India, including the Stock Farm of the Imperial Department of India at Pusa. As a result, the cows are usually considered to be better milkers than those of any other Indian breed.

Sources of the Livestock.

A start was made in October, 1926, when a small herd of pure-bred Montgomery or Sahiwal cattle, comprising four cows, one two-year-old heifer, one two-year-old bull and one yearling bull, was introduced at Serdang. The original stock was introduced from the Indian Government Stock Farm at Pusa. In addition to the above, a pure-bred Montgomery bull introduced from Pusa in October, 1924 by the Department and loaned to the Central Mental Hospital, Tanjong Rambutan, was transferred to Serdang in July 1926, for use as stud bull.

In June, 1928, two Australian Ayrshire cows, with two calves at foot, were presented to the farm by H.H. the Sultan of Johore.

At the end of 1928, the herd was further augmented by the introduction of four pure-bred Montgomery incalf cows and one Montgomery bull from Pusa.

In October, 1929, two high-class pedigree Friesian bulls ("Refiner" and "Controller") were introduced from the Hong Kong Dairy Farm with a view to increasing the milking qualities of the herd.

In June, 1930, six pure-bred Friesian incalf heifers were introduced from Australia in order to test the suitability of pure-bred Friesian cows on the plains in Malaya.

At the beginning of 1932, a pure-bred Jersey bull, six Jersey-Montgomery cross-bred cows and one Indian cow were transferred from the Government Dairy Farm at Fraser's Hill, and at the end of that year the milking stock was further increased by the purchase locally of two Indian cows of mixed origin.

The herd has naturally increased as a result of breeding and, after allowing for the sale of a large number of young bulls for stud purposes, at the end of 1933 there were 51 head of cattle on the farm, as detailed in the following table:—

Breed.		Cows.	Heifers.	Bulls.	Bull Calves.
Montgomery	...	12	2	2	1
Friesian	...	3	3	2	—
Friesian ½ x Montgomery ½	...	1	6	—	5
Friesian ¾ x Montgomery ¼	...	—	1	—	—
Jersey Crossbreds	...	5	1	—	—
Indian (locally-bred)	...	3	2	—	—
Montgomery ½ x Indian ½	...	—	1	—	—
Fries. ½ x Jer. ¼ x Mont. ¼	...	—	1	—	—
Total	...	24	17	4	6

Situation and Climate.

The farm is situated at Serdang in the State of Selangor and is approximately 3° North of the equator. The climate is monotonously equable and shows little variation throughout the year in the mean minimum and mean maximum temperatures.

The mean minimum temperature recorded at Serdang is 72°F., whilst the mean maximum is 91°F.

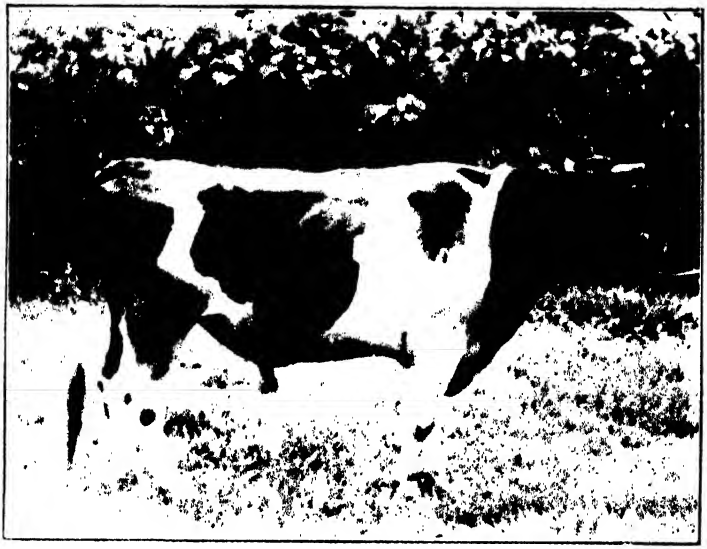
The rainfall is fairly evenly distributed throughout the year, there being no pronounced long dry seasons, and the average total rainfall is about 93 inches per annum. On the average, there are 165 wet days during the year.

The continuous luxuriant growth of vegetation throughout the year, even during the driest months, is such that the preservation of fodder in the form of hay or silage is unnecessary.

Buildings and Water Supply.

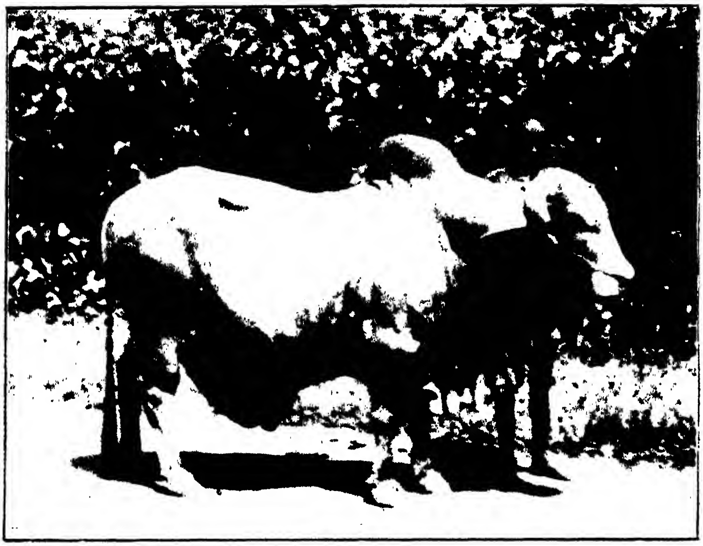
Buildings.—The farm buildings, which are mostly of the semi-permanent type, comprise the main cattle byre, one set of six calf and young stock boxes and one set of two bull boxes.

The main cattle byre is a building 75 feet long and 33 feet wide, constructed of wood and expanded metal, with roof of cement-asbestos sheets, the floors and feeding troughs being of cement-concrete, while stalls and

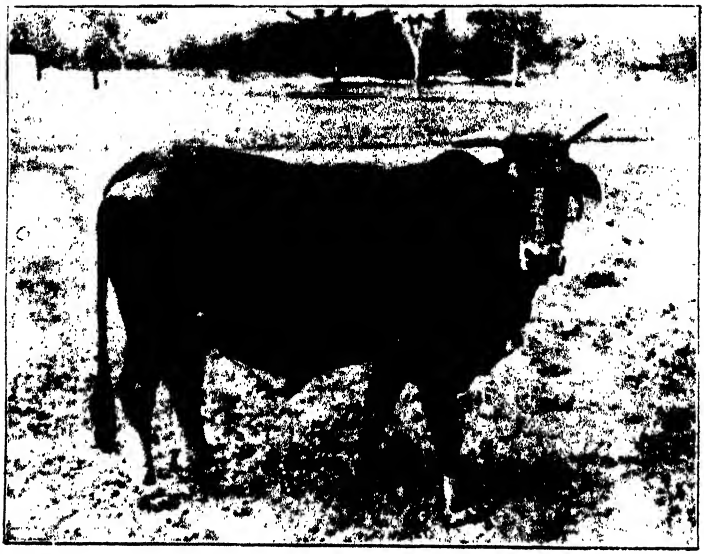


"Controller". Friesian Bull. Imported.

Friesian Cow. Imported.



Imported Montgomery Bull.



Imported Montgomery Cow. (dry).

stanchions of the modern steel type have been fitted. The feed room and milk room are situated at one end of the building, being separated by a passage to the byre.

The set of six calf and young stock boxes are contained in a similarly constructed building 51 feet long and 17 feet wide, with a 4-foot feeding passage at the back and a 4-foot open verandah on the front. Each box is fitted with two half doors, which open out on to the verandah.

The two bull boxes are contained in a permanent building 21 feet long and 20 feet wide, constructed of cement-concrete with cement asbestos roof. A feeding passage 4½ feet wide is provided at the back and the double half doors open on to a 6½ foot verandah.

Water Supply.—In all the buildings there is a continuous supply of pure water for each animal on the central tank principle.

Rubber Flooring.—It may here be mentioned that in the byre an experiment is being made, in collaboration with the Rubber Research Institute of Malaya, to ascertain the suitability of rubber flooring for cattle standings. In March, 1933 the floors of three stalls were relaid with a cement-rubber composition devised by the Rubber Research Institute in the course of its rubber roadway trials. After several months wear the spreads showed no sign of ageing or deterioration in any of the stalls.

Pasturage.

An area of approximately 60 acres of land has been allotted to grazing paddocks and a further 20 acres to the cultivation of Guinea grass for green soiling. Roughly, 40 acres of the pasture land can be classed as poor and the balance of 20 acres, situated in a low-lying position, as almost infertile.

These lands were all provided with open drains, but later a portion of the low-lying area was underdrained with subsoil pipes. Although the cost of subsoil draining was high, the result is very satisfactory and the grass on this area has much improved since the operation was carried out.

Owing to previous cultivation of the 40 acres grazing field, situated on higher land, a stand of natural grasses, intermixed with various leguminous cover plants, took possession of the ground, which very soon provided excellent pasturage. The block was free of lalang grass (*Imperata arundinaceae*) in the first instance, but it was found, after only a few months, that it commenced to make its appearance and a regular patrol has since been necessary to effect control.

The cost of this is estimated at one cooly day monthly for every five acres. No relaxation of effort in this respect is possible, otherwise the lalang grass would obtain such a hold on the land that its eradication would later become very costly. It will be seen, therefore, that the cost of such a patrol is likely to be a steady drain in labour charges on stock farms in Malaya, if first class pasturage is to be maintained.

Experience has shewn that in laying down a pasture in Malaya it is advisable to establish a mixture of indigenous local grasses, such as cow grass (*Paspalum conjugatum*) and carpet grass (*Axonopus compressus*). Dallis grass (*Paspalum dilatatum*), an Australian grazing grass, has been planted with success in this country, but it is gradually replaced by the stronger-growing local grasses and it is quite impossible to keep it, or any other grass, as a pure stand for any length of time.

The policy recommended is to use fenced areas of limited acreage for combined grazing and exercise purposes and to permit the native low-growing grasses to take possession of the land; provided that lalang is kept under control, the stand of grass will consist principally of the indigenous *Axonopus compressus*, which is a good grazing grass.

It may be added that in order to prevent the breeding of flies and the fouling of the ground, it is important that cattle excrement on the grazing area should either be spread or removed at least once a week.

Fodders.

Fodder Grasses.—In view of the comparatively low feeding value of the pasturage, it is necessary, under Malayan conditions, to supplement grazing by stall-feeding with more highly nutritious grasses, such as Guinea grass (*Panicum maximum*), Merker grass (*Pennisetum merkeri*) or Napier grass (*P. purpureum*), all of which have been established at Serdang.

Of these three, Guinea grass is to be preferred and is the principal fodder crop grown on the farm.

Guinea Grass.—This fodder grass has been established on approximately 20 acres and is planted at a distance of 3 feet x 3 feet square. The grass is cut at intervals of about 3 weeks and when grown on land newly-opened from jungle has yielded over 40 tons of green grass per acre per annum. In order to maintain such a high yield, however, high cultivation, and heavy manuring is required.

Investigations designed to ascertain the yield of Guinea grass when cut at varying intervals from one to four weeks, and the amounts of plant nutrients removed from the soil thereby, showed that when moderate dressings of fertiliser were applied, yields at the rate of about 15 tons per acre per annum were obtained on previously cropped land. The most suitable interval of cutting was found to be there weeks (1), at which stage the grass is probably the most palatable.

It is probable that the best results will be obtained by replanting at intervals of 3 or 4 years.

The quantity of cut Guinea grass allowed to adult stock for stall-feeding is restricted to 40 lbs. per animal per diem, while young stock receive from 15 to 30 lbs. each per diem, according to age.

Merker Grass.—This is a tall, coarse, erect-growing grass, attaining a height of about 8 or 12 feet. It is easily propagated from portions of the mature stock and the usual planting distance is 5 feet x 5 feet square. The first cutting is taken six months from the date of planting and subsequent cuttings are made every four weeks. Under good conditions, approximately 60 tons of fresh fodder per acre per annum are obtained.

When cut in the young state it is an excellent fodder for all classes of cattle but, as the stems mature, the fodder becomes coarse and unpalatable, in which stage it is useless for feeding purposes.

Napier Grass.—This is a tall, coarse-growing, perennial grass, very similar to Merker grass, but having a more vigorous root system, it resists drought. Propagation is effected by short stem cuttings, which are planted 5 feet x 5 feet square.

As in the case of Merker grass, harvesting may commence at about six months from planting, subsequent cuttings being made at intervals of 4 to 6 weeks.

Leguminous Fodders.—The high protein, phosphoric acid and lime content of leguminous fodders profoundly influences the rate of growth of young animals and milk production of cows in temperate climates; consequently they are extensively fed in European countries. In striking contrast, little use is made of legumes in Malaya for stock feeding.

Numerous trials have been made with a number of legumes at Serdang, but with unsatisfactory results. On small experimental plots, on land of average fertility, yields of about 7 tons of green fodder per acre have been obtained with cow peas (*Vigna unguiculata*), while horse gram (*Dolichos biflorus*) has yielded over 8½ tons of green matter per acre.

Trials have also included Soya bean (*Glycine hispida*), Bengal gram (*Cicer arietinum*), and Black gram (*Phaseolus Mungo* var. *radiatus*), but the yields in all cases were very low.

Lucerne or alfalfa (*Medicago sativa*) has also been tried repeatedly at Serdang and on each occasion has proved a complete failure.

If satisfactory leguminous fodders could be found it would no doubt be advantageous, but their inclusion in stock rations in Malaya is probably of more importance in the case of imported European breeds than of native animals.

Rations for Stock.

Observations have shown that a ration of 40 lbs. of Guinea grass per day fed in the stalls, with grazing *ad libitum*, will fatten dry (pregnant) Indian Montgomery cows without the addition of any concentrates; on the other hand, dry Friesian cows require concentrates in addition. This is probably due to the greater power of digestion of Indian cows and also probably, in part, to the lower vitality of imported Friesian stock in the tropics.

Under these conditions, there appears to be no necessity for a maintenance diet for Indian cows other than grass, except for a few weeks prior to calving. Consequently, it is the practice on the farm to feed a production ration a little in excess of that required for the daily yield of milk in the case of the Indian cows, whilst the Friesian cows are given a full maintenance diet, along with a production ration having a slight excess of proteins in its composition.

These feeding methods induce the cows to secrete their maximum yield of milk. If, in feeding, it is noticed that individual cows put on flesh instead of yielding milk, the ration is reduced accordingly, since in such cases it is obvious that the ration is in excess of the needs for milk production.

The following particulars show the standard rations employed at Serdang for mature cows and calves :—

(*a*) *Mature Cows.*—

Animals of 800 lbs. live weight and yielding 1 gallon (10 lbs.) of milk per day are given 40 lbs. of Guinea grass per diem and allowed to graze in addition, while the ration of concentrates given to cows in milk is as follows :—

Rice bran	... ...	2 lbs.
Crushed Horse or Bengal gram	...	½ lb.
Coconut cake	... ...	1 lb.
Gingelly cake	... ...	2 lbs.

An allowance of 2½ lbs. of this mixture is given as a maintenance ration to all cows in milk and those which cannot maintain their condition on Guinea grass alone.

An extra 3 lbs. of the ration is added for each gallon of milk produced.

(*b*) *Calves.*—

The young calves are fed on whole milk until they are about one month old. Afterwards, they are given a reduced ration of milk, which is supplemented with half a pound of linseed cake per day.

From six months onwards they receive a mixture of the following concentrates :—

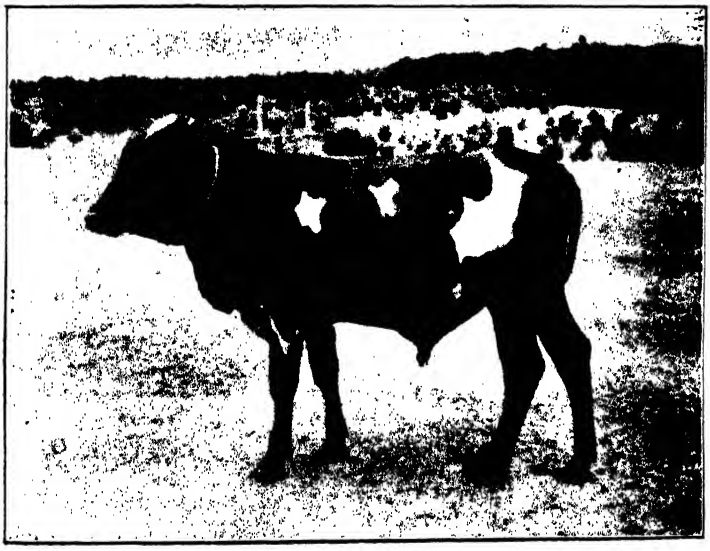
Rice bran	... ...	3 parts.
Crushed Horse or Bengal Gram	...	1 part.
Linseed cake	... ...	1 part.

This ration is fed at the rate of ½ to 2 lbs. per day, according to age, until the animals are two years' old. In addition, they are allowed Guinea grass *ad libitum*, which amounts to about 30 lbs. per day for the two-year-old animals.

Milking Routine.

Milking is carried out twice daily; at 4.30 a.m. and at 1.30 p.m. Every precaution is taken to ensure a clean supply of milk and immediately before milking, the byre is hosed down and the cows' udders are carefully washed with

Friesian × Montgomery Half-bred heifer.



Friesian × Montgomery Half-bred Bull Calf.

Malayan bred Montgomery Bull.

Jersey × Montgomery Half-bred Cow.

soap and water. The milkers are provided with clean white smocks, which they wear until the milking is finished and all the milk has been passed on to the adjoining milk room.

Hand-milking is practised at present, but it is hoped that later a trial will be made with milking machines.

The milk is weighed immediately it is drawn and the morning and evening yields of each cow are recorded on a standard type chart. After weighing, the milk is poured into a funnel and passes through the wall of the milk room, where it first flows through a filter of cotton wool and then over a milk cooler, through which a stream of cold water from a refrigerator is delivered. By this means, the temperature of the milk is reduced to about 60°F. Immediately after cooling, the milk is bottled in regulation pint and half-pint bottles, capped with paper discs, the latter being covered with a thin layer of paraffin wax, which is impressed with a special seal and is then ready for delivery.

After each milking, all dairy utensils and bottles are washed, first in cold water, then in hot water and afterwards steam sterilised.

Quality of the Milk.

Owing to the prevailing high air temperature and the resultant intense bacterial activity, great care is necessary to produce high-grade milk on the plains in this country and continuous supervision of the labourers is necessary to maintain the degree of cleanliness required.

Surprise sampling of the milk is carried out monthly by Inspectors of the Health Department and the samples are submitted to the Institute for Medical Research for bacteriological and chemical examination.

It has been found possible to keep the bacterial counts of samples well below the standard of "Certified Milk" (30,000 per c.c.).

Table I shows the results of the latest reports from the Health Officer, Inland Districts, Selangor.

The average butter fat content of the different breeds is in all cases well over the legal standard in the Federated Malay States of 3.25 per cent.

Particulars of yields of milk obtained from the different breeds of cattle in the herd are also given in Table II. Although the farm has only been established for a comparatively short period and therefore sufficient time has not yet elapsed to show the results of upgrading for milk production, the increased yield obtained from both imported Friesian, Indian and Cross-bred stock compared with locally-bred Indian cows is suggestive.

The suckling of the calves during the lactation period affects the yields of the Indian cows adversely as compared with pure-bred Friesian and Cross-bred Jersey-Montgomery cows, from which calves are removed at birth.

Table I

Bacteriological Examination of Milk Samples from the Government Dairy Farm, Serdang.

Date.	Sample.	No. of Organisms per c.c. developing on Agar at 37oC.		"B. Coli" absent from:	
		24 hrs.	48 hrs.	24 hrs	48 hrs.
22-1-34	No. 1	2,500	3,500	1 c.c.	1 c.c.
	,, 2	1,600	2,000	1 c.c.	1 c.c.
27-2-34	,, 1	150	300	1 c.c.	1 c.c.
	,, 2	250	450	1 c.c.	1 c.c.
20-3-34	,, 1	350	400	1/10 c.c.	1/10 c.c.
	,, 2	300	350	1/10 c.c.	1/10 c.c.

Table II.

Particulars of the Yields, Lactation Period, and Average Butter Fat Tests of the Different Breeds of Cattle at Serdang.

	Milk Yield in pounds.	Lactation Period.	Average Butter Fat Test.	
	lbs.	Days.	a.m.	p.m.
Montgomery Cows:				
No. 22 ...	4,577	481	5.2	6.0
No. 2 ...	3,458	306	4.0	4.5
No. 3 ...	2,099	419	4.1	4.2
No. 4 ...	3,421	344	3.6	4.1
Friesian Cows:				
No. 37 ...	5,232	531	3.6	4.1
No. 42 ...	5,017	354	3.9	3.9
Jersey x Montgomery Crosses:				
No. 66 ...	4,700	360	4.2	4.4
No. 63 ...	4,420	210	4.0	4.2
Indian Cows (locally-bred):				
No. 55 ...	1,963	274	4.5	4.9
No. 56 ...	1,519	279	4.3	4.6

Indian Cow. Local purchase.

Indian Cow. Local purchase.

Normally a cow giving a yield of less than 3,500 lbs. (350 gallons) in a lactation period not exceeding 350 days would be discarded from the herd as a poor milker, but until the size of the herd is substantially increased, this policy cannot be adopted.

Grooming and Spraying the Livestock.

Most European breeds of cattle in the tropics appear to retain the cold climate characteristic of growing a heavy winter coat. Periodic clipping of the hair is therefore a great relief to such animals during hot weather and facilitates the destruction of ticks. The long hair makes excellent cover for these parasites and affords protection against poisonous sprays applied to destroy them.

The fine hair of the Jerseys, in comparison to the rough coats of the Friesians, makes them more suitable in this respect for the tropics.

For keeping the hair of stock short a hand-power flexible shaft-drive clipping machine, as commonly used for horses, has been employed with success on the farm.

With regard to the control of ticks, the policy at Serdang is to spray all animals with an arsenical cattle dip once a week. In addition, any casual ticks which may gain access to the stock in the interval between spraying operations are removed by hand-picking during grooming.

Health of the Stock.

While the general health of both the locally-bred and imported Indian animals has so far proved satisfactory, that of the various imported European breeds has been indifferent in spite of the greatest care in housing, handling and feeding.

The Indian breeds are apparently immune to Red Water Fever (Piroplasmosis) caused indirectly by the incidence of ticks, but imported cows of the European breeds are very susceptible to it; the bulls, on the other hand, once they are acclimatised, appear to resist infection.

The following brief account of the behaviour of the various importations of European breeds under conditions obtaining on the plains at Serdang is of interest in this connexion.

(1) *Ayrshire Cows from Australia.*—The two grade Ayrshire cows, with calves at foot, transferred from Johore in June, 1928, never appeared to be in a normal state of health at Serdang. One cow succumbed to Pneumonia in November, 1928, after being treated for Piroplasmosis and the second cow died of *Gastro enteritis* in May, 1929, which disease was associated with Piroplasmosis.

Owing to sickness of the dams, the calves from these two animals did not get a good start in life and were to some extent stunted. One of them contracted Pneumonia and died in May, 1932, while the second

animal proved to be sterile and therefore was sold for beef at the end of that year.

(2) *Friesian Bulls from Hong Kong.*—The two pure-bred Friesian bulls received from Hong Kong in October, 1929, were just over one year old when they arrived at Serdang. Both animals were received in good condition and to date have shown little sign of sickness. One of them suffered from a mild attack of Piroplasmosis shortly after arrival, but on being treated with intravenal injections of trypan blue, soon recovered its normal health.

(3) *Friesian Cows from Australia.*—The six pure-bred Friesian heifers introduced from Melbourne in June, 1930 proved a failure. On the other hand, it should be mentioned that all these animals were received in poor condition with the result that, in spite of every precaution being taken to keep them free from ticks, they all contracted Piroplasmosis within a few weeks of their arrival at Serdang, one of these animals dying from the disease; shortly afterwards a second animal contracted anthrax and died. During 1932, two other cows died of *Gastro enteritis*, probably as a result of general debility caused by Piroplasmosis, while another cow recently lost condition to such an extent that it had to be destroyed. The remaining cow and three heifers have remained moderately healthy since the initial attacks of tick fever, which probably immunised them to some extent against further infection.

The above results indicate the difficulty of keeping cows of the European breeds in satisfactory condition on the plains in Malaya. On the other hand, the bulls of such breeds, when regularly sprayed with arsenical cattle dip, are comparatively free from Piroplasmosis.

The apparent relative immunity to Piroplasmosis of the Indian breeds and of cross-bred animals, the progeny of Indian and European stock, is a great asset in the establishment of a dairy herd in the tropics. This, however, does not eliminate the need for constant attention to the eradication of ticks from both locally-bred and imported animals by spraying and grooming. If this is neglected, the general debility produced by tick infection weakens the animals and this renders them liable to contract various diseases common to cattle in the tropics.

Observations on Preliminary Breeding Trials.

Since the farm has only been in existence for a comparatively short period, there has obviously been insufficient time to obtain any very definite results on the breeding trials. In the meantime, however, successful first and second crosses have been obtained between Friesian and Montgomery breeds. It will be interesting to watch the performances of these animals, both as regards milk production and immunity from tick fever.

Mention may also be made of the Jersey x Montgomery cross-bred cows transferred from Fraser's Hill, since these animals have been apparently immune to Piroplasmosis. Although only two lactations have been completed to-date by these cows, it has been shown that the monthly yields of milk are high. One of the cross-bred cows has given a yield of 456 gallons of milk during a lactation period of twelve months.

The upgrading of the pure-bred Montgomery animals is being followed as far as the smallness of the herd permits.

Although considerable difficulty is experienced in inducing the Montgomery bulls to serve the pure-bred Friesian cows to obtain the Montgomery x Friesian cross-bred, there is little trouble in procuring the Friesian x Montgomery cross-bred, since the Friesian bulls are much more active than the sluggish Montgomery bulls.

In view of the apparent unsuitability of the lowland climate in Malaya to the pure-bred European types of cows as opposed to the bulls, the latter should always be employed for crossing with the Indian Montgomery cows in cases where cross-bred animals are desired. Apart from this factor, allowance must be made for the prepotency of the bull in transmitting to the offspring the high milk-yielding qualities inherent in the animal. Therefore, the offspring of a Friesian cow mated to a Montgomery bull is likely to have a lower milk yield than its dam, while the reverse cross should have the opposite effect. Similarly, a cross-bred Friesian-Montgomery bull would probably have a much greater influence on milk production of the progeny than a pure-bred Montgomery bull.

General.

Although the purpose of this experimental stock farm is primarily for carrying out research in animal husbandry, a careful study has been made of the production of high-grade milk. The modern methods of dairying adopted on the farm have shown that it is possible with Asiatic labour, properly supervised, to produce high-grade milk in the tropics.

In addition to the work already recorded, a not inconsiderable number of pure-bred and cross-bred bulls of the different breeds have been distributed throughout the country for the improvement of local livestock.

The writers acknowledge the useful work of Mr. N. Kanagaratnam, Stock Farm Assistant at Serdang, who has had detailed charge of the farm, also the services rendered by the Government Veterinary Surgeon, Selangor and his assistant, who have been of great assistance in the diagnosis and treatment of sick animals.

Reference.

(1) Manurial Experiments with Guinea Grass at Serdang. By V. R. Greenstreet and J. L. Greig, *Malayan Agricultural Journal,* Vol. XXI No. 11, November, 1933, p. 543.

PANCHANG BEDENA CONTROLLED DRAINAGE SCHEME

BY

J. L. MILLER,

Drainage and Irrigation Engineer, Telok Anson.

The area embraced by the above scheme consists of approximately 15,000 acres of the coastal flats in the sub-District of Sabak Bernam in the State of Selangor. It is bounded on the west by coconut estates, on the north by the Bernam River, on the south-east by a forest belt and *permatang** and on the south-west by the Straits of Malacca.

The scheme is one of "Controlled Drainage" and consists primarily of three main drains, the largest of which has a bottom width of 20 feet, running paralled to one another from north-east to south-west and discharging into the Straits of Malacca. The largest has also an outlet, at the north, into the Bernam River and is graded to fall both ways from the centre. All four outlets are gated and fitted with automatic tidal flaps on the outside, together with positive action sluice valves on the inside. In this way, not only is salt water prevented from entering the system, but the water inside the drains can be maintained at a constant level.

The area is protected from high tides on the sea side and from flooding from the Bernam River on the north by substantial peripheral bunds which are built up to 2 feet above the highest recorded tide level and have a top width of not less than 10 feet. The eastern extremity of the coastal bund is carried northwards to the point where the land rises to the *permatang**. The western side of the area is protected by the existing coconut estates, and a low bund with a top width of 6 feet is sufficient to give control of the ground water required for cultivation.

Discharging into the main drains and running at right angles to them are sixteen cross drains, each with a bottom width of 8 feet. Each cross drain has its own control gate so that the water level in any drain is independent of the water level in the main drain.

The spoil from these drains is utilized to form bunds parallel and adjacent to them which have the effect of making each strip of land between two such drains into a separately controlled drainage area. The bunds also serve the useful purpose of access paths.

The drainage in the whole area is, therefore, completely under control. All gates can be opened to dry the land before harvest and in the padi-planting season, individual gates may be closed to retain in each particular section, sufficient water for cultivation.

The total lengths of main and subsidiary drains in the area are approximately 12½ miles and 45 miles respectively and the average area of each

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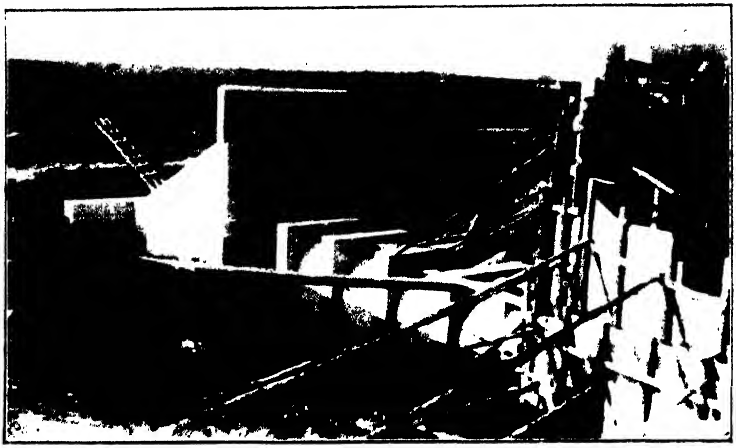
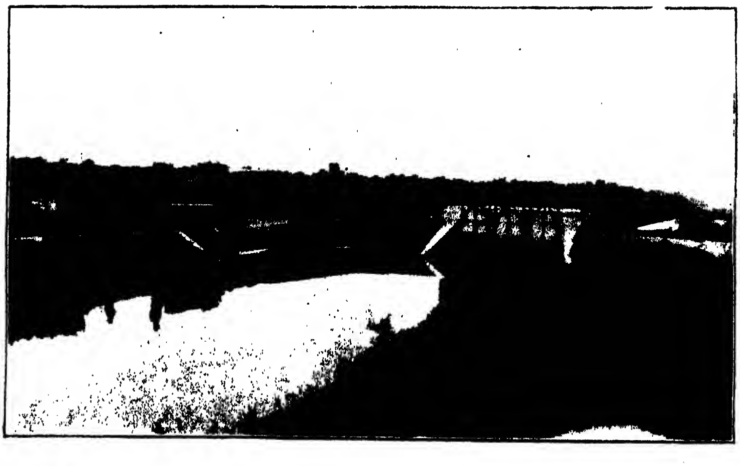
***Ridge of higher land, sometimes old sea-beach.**

CROSS DRAIN A_2 D_4 BEING EXCAVATED.

BANJAREE COOLIES AT WORK ON CROSS DRAIN A_4 INDICATING THE NATURE OF THE WORK.



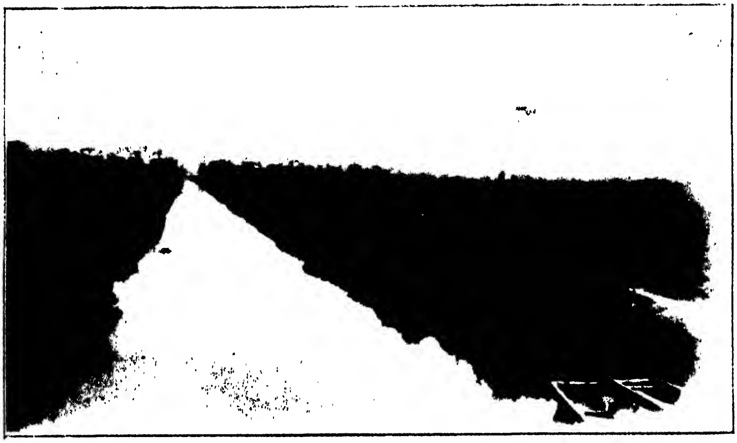
SUBSIDIARY CONTROL GATE ON A CROSS DRAIN UNDER CONSTRUCTION.



MAIN AND SUBSIDIARY CONTROL GATES, SUNGEI BESAR.

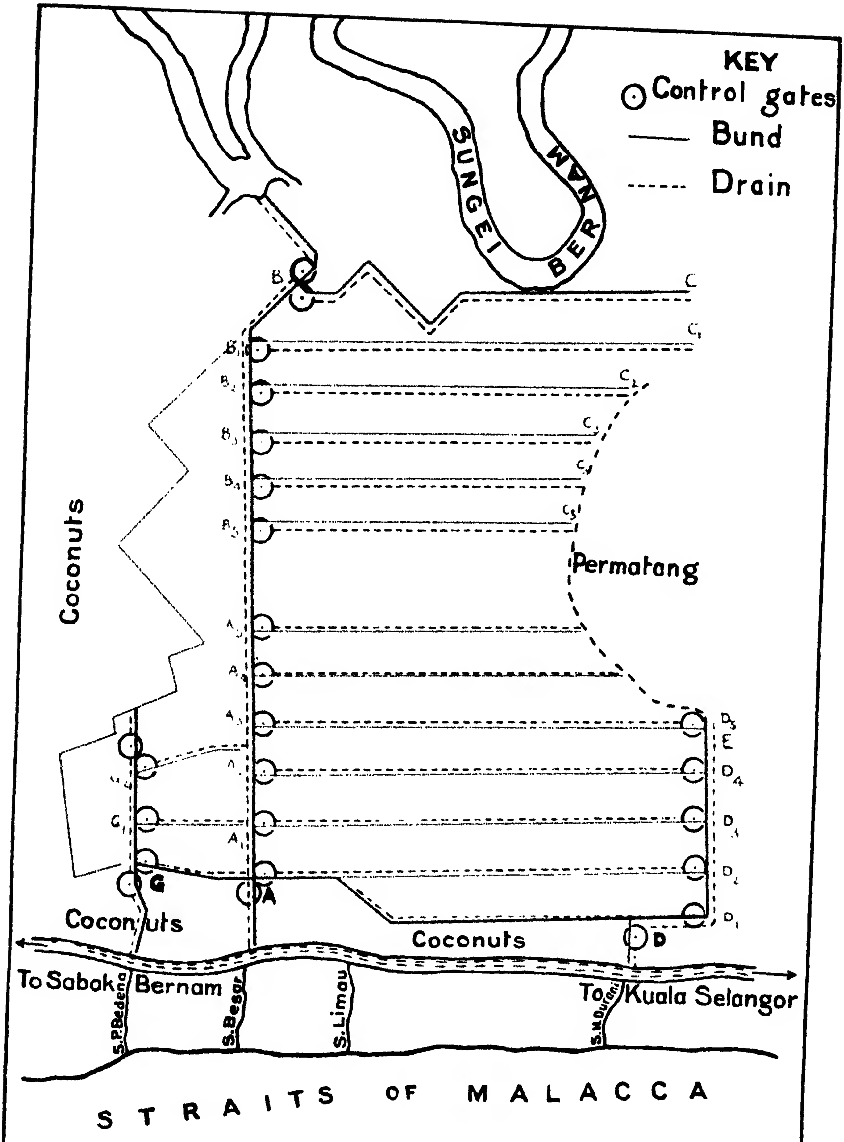
CONSTRUCTION OF CROSS DRAIN A_2 D_1 SHEWING NIBONG ROOTS ENCOUNTERED.

BANJAREE COOLIES WORKING UNDER DIFFICULTIES.



Part of the Main Drain from Sei Besar to the Bernam River after completion.

New opened up land.



SKETCH SHOWING DRAINAGE SYSTEM

PANCHANG BEDENA PADI AREA

controlled section is approximately 900 acres.

All control gates are of the long culvert type. The 42 inch diameter reinforced concrete pipes are laid on a concrete raft on a *bakau* foundation.

Progress of Work.

The work is now about two-thirds completed and is expected to be finished by the end of 1934. Jungle clearing for the drain reserves, gate construction and main and subsidiary drain excavation are being carried out in sequence and, as each successive subsidiary drain is completed, a further controlled area becomes available for cultivation.

It is estimated that 6,000 or 7,000 acres have already been felled of jungle and are under padi at the time of writing. The control of the water levels in the completed sections is proving quite successful.

The rapidity with which the land is being occupied is exceedingly gratifying. In the initial stages, the work of felling and opening up went ahead of the control works. This fact is interesting in view of the gloomy fears expressed in some quarters that colonisation of new rice lands will be a failure.

Colonisation, though difficult, has up to the present presented no insuperable obstacles in spite of the fact that the activities of the Drainage and Irrigation Department have already resulted in the provision of new padi lands up to a total of nearly half the area of the lands watered by the Krian Irrigation Works.

The geographical position and topographical nature of the land have been the two factors governing the work of construction. Access, either by land or sea, was (and still is) difficult and conditions of life in no way help to retain labour which has been attracted to the area.

Parts of the jungle which covered the area contained an unusually large proportion of nibong (*Oncosperma filamentosa*, Bl.) the poisonous spikes of which hindered the work of clearing, while the roots proved an equal hindrance during earthwork.

While the uniform flatness of the ground is ideal from the padi cultivators' point of view, it was unpleasant to find that the jungle held up standing water throughout the year. Jungle clearing and burning for the drain reserves was therefore difficult. Drain excavation was carried on rapidly during the dry season but, in wet weather, the actual rainfall, added to the heavy run off from the newly opened areas, made conditions extremely unpleasant. Two of the accompanying photographs give a good idea of working conditions.

Work of a good standard is, however, being carried out at low rates and the cost of the scheme is expected to be between $16 and $17 per acre.

CONDITIONS ON SMALL RUBBER HOLDINGS IN MALAYA.

1st Quarter 1934.

Prepared by the Economics Branch of the Department of Agriculture, S.S. and F.M.S. in collaboration with the Field Branch of the Department of Agriculture.

Rainfall.

The month of January was characterised by an unusual period of wet weather, giving a rainfall much above the average in all parts of the Peninsula except in the State of Kedah and Kelantan and a few other localities including Cameron Highlands. The wet period occurred generally during the first fifteen days to three weeks of the month, but in Krian and Larut Districts of Perak and on Cameron Highlands the middle ten days constituted the wet period. While Krian and Larut Districts experienced a heavy rainfall, minor floods occurred in Pahang and more severe floods in Johore and Singapore Island. During February in Pahang and Selangor warm dry weather was interrupted by fairly frequent thunderstorms and high winds; in Negri Sembilan, Malacca and Johore, warm dry weather prevailed. In Kelantan and in Singapore Island the first half of the month was cool and showery, while the second half was warm and dry. Conditions during March were nearly normal in Kedah and Kelantan, though the rainfall was somewhat below the average and in the eastern State the second half of the month was hot and dry. The rainfall was much above average in the southern part of the Peninsula, from Negri Sembilan to Singapore Island, being especially heavy in the first half of the month when floods occurred in Johore and Singapore Island.

Prices.

Table I which is appended shows the ruling prices for the period January to March 1934 for small holders' rubber, and it will be noted that there has been a further increase in price as compared with the 4th. quarter of 1933.

Table II.
Average Singapore Prices for Small-holder's Rubber.

	Smoked Sheet $	Unsmoked Sheet $	Scrap $
January	19.00	17.50	6.00
February	20.00	18.50	8.50
March	22.00	20.50	7.50

Table I.

Rubber Prices [in Straits dollars per picul (133⅓ lbs.)]

1st Quarter, 1934.

	Singapore standard sheet Average	Singapore for small holder's rubber at end of month	Penang for small holder's rubber	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Province Wellesley	Kedah	Johore (Av: of 10 centres)
					JANUARY						
Smoked sheet.	19.32	19.00	—	13.50-18.75	14.00-19.50	14.00-18 65	10.00-19.90	16.00-17.00	16.00-18.00	14.50-19.50	14.00-16.50
Unsmoked sheet.		17.50	13.50-16.50	11.00-16.00	12.00-17.50	10.00-16.50	8.00-16.50	10.00-15.00	14.00-16.50	12.50-17.00	12.30-13.67
Scrap		6.00	4.00-7.00	3.00-6 50	3.00-7.00	2.00-6.00	3.00-6.50	4.00-6.00	5.00-6.00	4.00-7.00	4.00-5.00
					FEBRUARY						
Smoked sheet	21.66	20.00	—	14.00-21.50	17.00-22.00	17.00-21.60	15.00-21.50	20.00-21.00	20.00-21.50	15.00-21.00	17.35-18.86
Unsmoked sheet		18.50	15.00-20.50	14.00-19.50	15.00-20.75	15.00-20.00	8.20-20.00	14.00-19.00	18.00-20.00	13.50-18.00	14.66-18.00
Scrap		8.50	5.00-8.00	2.50-9.00	4.00-8.00	4.00-8.00	3.00-8.00	5.00-9.00	7.00-8.00	5.00-8.00	4.25-5.91
					MARCH						
Smoked sheet.	22.77	22.00	--	18.50-23.00	19.00-23.80	19.00-23.00	17.20-23.00	21.00-22 50	20.00-23.00	18.00-24.00	19.36-21.90
Unsmoked sheet.		20.50	19.00-22.50	16.00-22.00	14.00-21.50	15.00-20.25	13.00-20.00	16.00-21.00	17.00-21.00	17.00-22.00	17.00-19.80
Scrap		7.50	7.50-9.00	3.00-8.50	4.50-10.00	4.00-9.00	4.00-8.00	5.00-9.50	7.00-9.50	6.00-8.50	5.00-6.00

The quotations in the Table show the ruling prices from a large number of buying centres. Factors such as transport and local competition affect the prices secured by the small-holder for his rubber.

Table II shows the trend of average prices ruling in Singapore per picul at the end of each month for *Kampong* rubber.

Tapping.

Reports from Negri Sembilan state that tapping systems remain substantially unaltered, extreme cases of excessive excision have been noted, as also has the use of ladders; these, however, are not common. Several holdings, the extent of which have not as yet been determined, are reported to have been newly opened up in the Coast District, but no areas of immature trees have been noted in production. As the price of rubber improved, many holdings in Selangor and other States were brought back into tapping, whilst no cessation of tapping was noted during the wintering period. In Malacca tapping continued to be heavy, opening of high panels, necessitating the use of ladders being quite a common practice. Reports from Penang and Province Wellesley state that tapping has been extremely active and that no abatement was observed during the wintering season, whilst in Kedah heavy tapping was continued throughout the quarter. In some districts in Perak, holdings have been cleaned up and tapping re-commenced. The area of untapped rubber is now low. Pahang reports state that a fairly considerable area of young rubber has been brought into tapping. The tapping generally is good but in some cases over-tapping has been practised.

Areas out of Tapping on Small Holdings.

The method of estimating the area untapped among small-holdings by means of counting the number of such holdings along the sides of main roads was again employed, the result of this computation is shewn in Table III and was applied to the known area of tappable rubber, 1927 planting and earlier.

The total area of tappable rubber on estates of less than 100 acres which was untapped in the Federated Malay States at the end of March 1934 is estimated on the foregoing system as amounting to approximately 34,950 acres as compared with 45,000 acres at the end of December 1933. The total area untapped in the Straits Settlements at the end of March 1934 is estimated to be 9,900 acres as compared with 14,000 acres at the end of December 1933.

Diseases.

Mouldy Rot.—Weather conditions favoured the spread of mouldy rot throughout Negri Sembilan during January. With a considerably reduced rainfall during February, the disease rapidly diminished and despite the fairly wet conditions of March, the situation at the end of the quarter was satisfactory. Reports from Selangor state that the disease was well under control during

the quarter, and similar reports were received in regard to the Settlement of Malacca. There was little to record regarding mouldy rot disease in the State of Kedah but the distribution of disinfectant was continued and was considerable. Perak reports state that mouldy rot was the only disease of real importance during the quarter. The increase in price of the commodity has resulted in painting being given somewhat more attention, but on the other hand, wet weather resulted in greater virulence of the disease. Departmental sales of an approved fungicide were not large, but many owners of rubber land purchase their requirements from local vendors. Tar remains a very common painting material in most localities. In Pahang, however, the sale of disinfectant has proved very popular. Towards the end of the quarter, the disease was again well under control.

Oidium Leaf Disease.—In the State of Negri Sembilan, 16 estates notified the presence of *Oidium Heveae* after the commencement of wintering, whilst in Selangor only one outbreak was reported. Reports from Malacca state that *Oidium Heveae* occurred in the usual areas, outbreaks of this disease also occurred on Central and South Kedah, but these were not severe and by the end of the quarter, following good rains, the attacks had almost disappeared.

Grades of Rubber Made.

Figures of the percentages of the various grades of rubber produced, where these have been recorded, are as follows:—Penang and Province Wellesley: (figures from 26 dealers) smoked sheet 17, unsmoked 66, scrap 17.

Kedah:—smoked sheet 48, unsmoked sheet 19, scrap 33.

Malacca:—smoked sheet 15, unsmoked sheet 64, scrap 21.

Selangor:—smoked sheet 80, unsmoked sheet 1, scrap 19.

Perak: Taiping:—smoked sheet 32, unsmoked sheet 50, scrap 18.
Kuala Kangsar:—smoked sheet 30, unsmoked sheet 41, scrap 29.
Larut and Matang:—smoked sheet 1, unsmoked sheet 78, scrap 21.
Selama:—smoked sheet 80, unsmoked sheet 15, scrap 5.

Johore: Muar:—smoked sheet 32, unsmoked sheet 58, scrap 10.
Batu Pahat:—smoked sheet 81.5, unsmoked sheet nil, scrap 18.5.
Tangkak:—smoked sheet 50, unsmoked sheet 35, scrap 15.
Pontian:—smoked sheet 5, unsmoked sheet 80, scrap 15.
Johore Bahru:—smoked sheet 25, unsmoked sheet 48, scrap 27.
Kota Tinggi:—smoked sheet 15, unsmoked sheet 60, scrap 25.

Table III.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres, at the end of March, 1934.

PERAK

District	Total Tappable area	Total area untapped	Percentage
Batang Padang	37,288	750	2
Kinta	34,180	1,600	5
Kuala Kangsar	43,485	2,200	5
Upper Perak	13,774	1,500	11
Larut & Selama	51,407	3,100	6
Krian	9,751	4,200	43
Lower Perak	47,937	2,400	5
	237,822	15,750	7

SELANGOR

District	Total Tappable area	Total area untapped	Percentage
Klang	18,879	2,300	12
Kuala Langat	29,263	1,200	4
Ulu Langat	38,867	400	1
Ulu Selangor	30,632	2,100	7
Kuala Lumpur	21,174	1,500†	5†
Kuala Selangor	9,379		
	148,194	7,500	5

NEGRI SEMBILAN

District	Total Tappable area	Total area untapped	Percentage
Seremban	19,241	1,200	6
Tampin	17,947	1,300	7
Kuala Pilah	17,470	1,900	11
Jelebu	6,270	200	3
Port Dickson	10,653	1,000	9
	71,581	5,600	8

PAHANG

District	Total Tappable area	Total area untapped	Percentage
Raub	7,361	1,200	16
Kuala Lipis	15,951	300	2
Bentong	13 600	1,800	13
Other Districts	31,223	2,800	9
	68,135	6,100	9

MALACCA

District	Total Tappable area	Total area untapped	Percentage
Central	17,687	1,400	8
Alor Gajah	31,387	5,000	16
Jasin	24,971	500	2
	74,045	6,900	9

PENANG & P. WELLESLEY

District	Total Tappable area	Total area untapped	Percentage
North	3,241	100	2
Central	7,067	800	12
South	8,149	—	—
Dindings	7,279	900	12
Penang	11,114	200	2
	36,850	2,000	5

SINGAPORE

District	Total Tappable area	Total area untapped	Percentage
Singapore	12,781	1,000	8
	12,781	1,000	8

The percentage of areas out of tapping in December, 1933, was as follows:—Perak 6, Selangor 11 the Negri Sembilan 12, Pahang 10, Malacca 14, Penang and Province Wellesley 5, Singapore 15.

* Estimated from same percentage as shown in Kuala Kangsar District.

† Estimated from mean percentage for remainder of State.

Reviews.

The Giant Snail in Batavia.

An article by S. Leefmans in *Landbouw* of December 1933 entitled "Preliminary Report on the Control of Achatina in Batavia" deals briefly with the steps taken in Netherlands India to control this pest.*

Damage was conspicuous only on banana leaves, though damage to flowering and ornamental plants is also noted. More extensive damage to vegetable gardens was prevented, it is claimed, by the measures taken before the pest had increased sufficiently as to prove a menace.

The snails feed on human and animal excreta, and will also enter buildings in search of lime. It is feared that the snails may spread to estates where they may multiply rapidly and become a serious pest.

In one large centre a campaign was organised to collect the snails. More than two million were caught and destroyed.

Two large centres in Batavia were cleared of snails by collection and by chemical measures. After clearing the growth, the infested area was sprayed with 4 per cent. copper sulphate. Furthermore, hedges and walls in the neighbourhood were white-washed with calcium arsenate. The snails have a real lime-hunger and so can easily be poisoned. These two areas are now totally free of snails.

As calcium arsenate is easily washed away from walls and trees by tropical rains, it is incorporated with lime and cement, of which mixture small lumps are prepared. These lumps are put in heaps in the infested area and if the snails feed on them they die within four days.

The method of poisoning described in this article is worthy of trial in Malaya. The use of copper sulphate in this connexion is well known and has met with some success in Malaya. Hand collection has been tried on a large scale, especially in Johore, but has not met with conspicuous success. Poisoning with calcium arsenate stones coupled with clearing up all possible breeding places should be an effective measure of control.

D. H. G.

Rubber Research Institute of Malaya Information Cards.

The Rubber Research Institute has published a series of seven Information Cards, suitable for desk or wall use, dealing with the manufacture of rubber. The titles are:—Standardisation and Coagulation, Some Estate Chemicals and their Uses, Defects in Rubber (two cards), Preservation of Latex for Export, Testing Preserved Latex, Useful Information. The set is contained in a folder and published at 50 cents in Malaya and $1 outside this country.

By reason of the concise method of presentation and the valuable information, rubber estate managers will find these cards a useful addition to the office table.

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* See also Review of another paper on this subject by the same author and another, published in the *Malayan Agricultural Journal* Vol. XXI No. 11, November 1933.

Abstracts

DERRIS ROOT AS A NETHERLANDS INDIA EXPORT PRODUCT.*

Substances used for the purpose of killing insect pests may conveniently be classified as (i) inorganic poisons, such as compositions of lead, copper, arsenic, sulphur, selenium; (ii) organic poisons, such as nicotine, thiocyanate, pyrethrum and derris extracts and (iii) petroleum compounds.

The use of many inorganic poisons, when applied to plants intended for consumption as food, involves risk of poisoning to mankind and animals.

To avoid the absorption by the human system of poisonous insecticide substances, a more direct method is being sought; at present the endeavour is to find insecticides which exercise a more specific action upon the insects and that will present no dangers to man.

However, just as there exists no panacea for all maladies and complaints, so there is no universal insecticide that can fight the very large number of noxious insect varieties in a practical and successful manner; so that the above-mentioned injurious insecticide substances will undoubtedly be retained in their proper places, although it is the intention to limit their use as greatly as possible and substitute for them insecticides not dangerous to the human system.

A good deal of attention has been paid to nicotine which, though a poisonous substance, might be less dangerous than are the inorganic insecticides. But both in the application of this chemical and in the consumption of products on which it is applied, cases of nicotine poisoning have been reported.

Extracts of pyrethrum have been tried, and also different varieties of derris and cubé roots, the active principle thereof being rotenone. It has been found that not only are such extracts practically non-poisonous to men and animals, but also that chiefly the extract of derris, or rather the rotenone, is much more destructive to a good many noxious insects than are the inorganic insecticides and nicotine. Poisonous action upon useful insects is but slight, seeing that derris insecticides retain their toxicity, once they have been sprayed upon the plants, for only a short time—which, however, in itself constitutes an objection to its application. To birds these and the pyrethrum compounds are harmless. For human beings rotenone, even in fairly considerable quantities, is without noxious effects. It is for this reason that such combination is employed in fighting exo-parasites of animals, as in cattle dips, and favourable results have also been observed in their effect on endo-parasites. In addition, rotenone can be used with considerable success to keep woollen articles moth-free.

The difficulty that rotenone, under the influence of direct sunlight, rapidly oxidises into inactive derivatives has been counteracted by adding soot to the liquid to be sprayed. But it has been found that dihydro-rotenone prepared

* Abstract and Review of an article by D. R. Koolhaas in the *Economic Bulletin of Netherlands India* Vol. I, No. 3, February 16th, 1934.

from rotenone through reduction according to a process analogous to the hardening of fatty substances, has at least the same insecticidal properties as has rotenone itself, and is more resistant to the influence of air and light.

Besides rotenone there are to be found in derris other substances with insecticidal properties, namely, degueline, tephrosine and toxicarol.

In some cases, rotenone is a stronger insecticide than is pyrethrum extract, which is its closest competitor.

Originally, an extract of derris root made by means of water and diluted with soapy water, was used as a direct insecticide. On account of the facts that a total extraction of poisonous substances was not readily effected by this method, that such extracts cannot be kept good without the addition of preservatives and also because the roots vary greatly as regards their poison contents, this method was found to be unreliable. Seeing that the rotenone is very much more poisonous to insects than are the other combinations present in the root, *Roark* suggested that the rotenone content is the only method by which to judge the value of the roots.

This is all the more important in view of the fact that various firms market not only a total extract from derris root, but also more or less pure rotenone.

Roots that have a content of less than 3 per cent. can be discarded when rotenone is to be prepared. The exporters of the root, whether it be a forest product or an estate-grown product, can demand a higher price if the rotenone content is in excess of the normal. *Roark* states that if planters will not supply derris root having a guaranteed rotenone content, it is very probable that the consumers will purchase cubé roots from Peru and Brazil.

This requirement is especially of importance in the case of the Netherlands India product, as it has a somewhat unsatisfactory reputation in this respect. Based on analyses of derris root samples from the forests of Western Java, it is concluded that this bad reputation is, generally speaking, unmerited, or at least unnecessary.

Information is given regarding derris cultivation, selection of stock and age at which the plant should be harvested. Methods of distinguishing good forest-grown derris roots from the useless parts of the plants are indicated. Deliberate substitution of other roots, which may occur in the forest-grown derris, is a reason for preferring the cultivated product.

The article states (on page 388) that in Malaya there is a derris estate at 1425 metres above sea level. This is inaccurate. Derris is not being grown as an estate crop in Malaya at this elevation. There may be small areas at this elevation, but not an estate.

Mention is made of other plants containing rotenone. At present, however, the only plant of importance besides derris, as a source of rotenone is *Lonchocarpus nicou* or cubé from South America. Commercial samples, 23 in number, which were analysed, shewed a rotenone content varying between 0.8 and 11.2 per cent., representing an average of 5.4 per cent. and a close

relation between the ether extract and the rotenone content. Derris is regarded as of more importance as an insecticide as it contains a higher proportion of other substances that have the same effect as rotenone.

It is considered that the use of rotenone-containing roots for insecticidal purposes will certainly increase in years to come. The use of pyrethrum is already fairly extensive, but in view of the manner in which derris is advertised and recommended, especially by the Government of the United States of America, its more extensive use may fairly be predicted, to the lesser employment of other insecticides, including perhaps pyrethrum. Also, a combination of derris and pyrethrum seems to result in a very useful insecticide, the application of which may prove to become even more general than that of either separately.

London prices of derris root in 1933 are stated, followed by brief information of packing for export and on sampling for analysis.

As it is very probable that derris, for certain soils and under definite conditions, especially when high-grade clones are planted, opens up possibilities for a paying cultivation, either as a sole or as a mixed cultivation, it will not appear strange that this plant, for some time past, has attracted a good deal of interested attention on the part of the various institutions connected with the Department of Economic Affairs in Netherlands India. Endeavours are now being made to obtain high-grade clones that can be used for planting, whilst the investigation of wild varieties and forms is being actively continued so as to assist the exporters of the forest product by supplying them with accurate information, and in order to have available in as short a period as possible, a considerable quantity of good planting material.

Note :—The above Abstract is published in this place to draw attention to the interest in derris evinced in Netherlands India. At the same time, the Department of Agriculture, Straits Settlements and Federated Malay States, does not necessarily agree with the views on the chemistry of the toxic substances put forward in this article. In particular, it is not yet admitted that there is conclusive evidence shewing that rotenone is the most active or most important toxic constituent in derris root. Work on this and other points is actively in progress in the Department. Naturally, the question of which, precisely, is the most important constituent does not affect the value of the root as a whole.—*Editor.*

SEVENTEENTH REPORT ON THE NATIVE RUBBER CULTIVATION

Fourth Quarter, 1933.

Prepared by the Bureau of Agricultural Economics of the Agriculture and Fisheries Service of the Netherland Indian Department of Affairs at Batavia, Java. G. Kolff & Co., Batavia. February 1934.

Prices.

During the first four months of 1933, the price of standard sheet rubber at Batavia averaged 7 guilder cents per ½ kg., after which, as a result of the economic measures taken in the United States of America, and a little later supported by the restriction negotiations, there was a firm price improvement, the price level rising to 12 guilder cents, and in November and December to 13 and 13¾ cents. The quotations for "blanket" followed this rise somewhat irregularly and less definitely: up to and including July, "blanket" prices remained at an average of 80 per cent. of the standard sheet quotations, after which this relation became modified to the disadvantage of the "blanket" article, amounting in the months of September 1933 to January 1934, inclusive, to 71 per cent., 65.6 per cent., 66.2 per cent., 67.4 per cent., and 70.4 per cent. thereof, respectively, this being the outcome, probably, of the relatively greater increase of "blanket" production in relation to "sheet" production, causing the former to be absorbed by the market at lower prices.

Exports.

The exports of the native rubber from Netherlands India sharply reacted to this price increase: quarterly exports of native rubber in net metric tons were:—13,420; 25,597; 36,687; 38,954 respectively. The total exports of rubber from the Outer Provinces in 1933 were 116,158 tons, which is a record. The increased exports, especially in the second half of the year, are attributed in part to the gradually increasing world price level and to labour becoming available upon the conclusion of the season's agricultural activities.

Local reports clearly indicate that, despite this high export figure, as yet less than one half of the tappable trees are in exploitation.

Labour.

Even now, hardly any outside labour is being used for tapping; it is done mostly by means of family labour with the assistance of local forces paid in production. Rubber cultivation in all Provinces still remains a secondary

occupation to food-crop production and this condition can only be looked upon as a satisfactory state of affairs.

The production increase in 1933 over 1932 is almost entirely represented by the group "wet slabs". The exports in metric tons (not in terms of dry rubber) of "rubber in cakes and slabs" during 1933 were 140,607 tons as compared with 67,655 tons in 1932.

Estate and "Native" Rubber.

A survey of the rubber exports from the principal centres of production is presented in a Table which indicates the very different reactions to the prevailing prices. The production of all groups since the second half of 1932 has increased, but in very varying degrees. Estate rubber reacted least of all, this product evidently not being able to adapt itself so readily to the circumstances brought about by the changeable prices as could the native cultivation. The strongest reaction, both to low and to high prices, is exhibited by the native production in Netherlands India, of which the export in the first six months of 1932 amounted to 48.3 per cent. only of that in the corresponding period of 1929, but increased to 143.8 per cent. in the second six months' period of 1933. The character of this cultivation as a secondary source of profit and the fact that a very considerable rubber-growing area is involved, makes it possible for it to react so acutely to world prices.

Local Reports.

Achin and Dependencies.—Despite activities connected with rice cultivation, rubber tapping increased, resulting in an export during the fourth quarter of the year of 165 tons as compared with 109 tons in the third quarter. It is estimated that at present about 30 per cent. of the tappable area is in production. Prices in Langsa in guilder cents per 100 kg. wet slabs were from f 6.20 to f 6.80 in October and for the last two months of the year around f 8.40.

Tapanoeli.—The exports from Sibolga amounted to 824 tons of dry rubber and, for the first time in 1933, of a small quantity of slabs. Local native market prices for first quality "Sheety crepe" varied between 14 and 15 guilder cents per kg. An improvement in quality is noted. Increased tapping applies to the older gardens and less to the younger and more distant holdings. The area at present being tapped is estimated to be from 40 to 50 per cent. of the total tappable area.

Sumatra West Coast.—Exports were 106 tons (dry equivalent) as compared with 60 tons in the third quarter. The recently-opened rubber mill at Padang worked up a considerable quantity of slabs into blanket rubber. Prices at Kota Baroe varied from f 4.50 to f 4.00 and at Bangkinang from f 2.30 to f 3.20. Although a number of gardens were cleaned up, considerable areas remain untapped.

Palembang.—During the quarter 5,660 metric tons were exported as against 4,982 tons during the third quarter of the year. December exports are exceptionally high at 2197 metric tons, attributable to completion of other work on

native holdings, demand for cash for approaching "Lebaran" festivities and to high market prices for rubber. At present prices further increased production is anticipated. In January 1934, 3371 metric tons of wet rubber was shipped from Palembang as compared with 3160 tons in the preceding month.

Djambi.—Exports increased considerably, being 8,492 metric tons in the last quarter compared with 6931 in the third quarter, 5170 tons in the second quarter and 3792 tons in the first quarter.

Increased production is attributed to favourable price, demand for cash and favourable weather conditions for tapping.

Riouw and Dependencies.—From the mainland 2706 tons (in terms of dry rubber) were exported and 577 tons from islands. Figures for the preceding quarter were 2528 and 326 tons respectively. The holdings in the islands are mostly owned by Chinese who are working with local or imported labour. In the sub-division of Lingga, sheet rubber was about 7 guilder cents per kati in the third quarter and 8 cents in the fourth quarter. Buyers and exporters are Chinese. Freight to Singapore is estimated by them at about $1 per picul.

Banka and Dependencies.—265 tons were exported from Banka, 218 of which consisted of sheet rubber and 41 tons of slabs, figured in dry equivalent. Export of sheet rubber increased considerably in the second half of the year. In the course of but a few months dozens of rubber mangles have been imported, the Chinese owners hiring them to rubber tappers. The sheets weigh from 1—1½ kati and are sometimes of good quality. Sheets of lower quality are again worked up in Singapore into blanket rubber, whilst the better sheets receive no further treatment.

Western Division of Borneo.—Exports in the fourth quarter amounted to 7,260 tons dry equivalent as compared with 8,226 tons in the third quarter. The decline is attributed to seasonal agricultural activities and to wet monsoon weather which reduced the number of tapping days. It also appears that Chinese are keeping back considerable quantities of rubber. Prices in Pontianak, in guilders per picul, varied from f 4.00 to f 5.50 in October; f 4.60 to f 6.50 in November and f 4.00 to f 6.25 in December. In the quarter under review there were still important areas left untapped.

Southern and Eastern Division of Borneo.—Exports fell from 8,386 tons dry equivalent in the third quarter to 6,988 tons in the fourth quarter. This decline is attributed to the rice harvesting and planting activities. It is likely that a higher export figure will be reached in January 1934.

The price per 100 kg. of wet and dry slab at different centres is stated. As an example of the price movement: at Kandangan wet slab was f 4.20 in October and f 5.20 in the latter part of December, while dry slabs varied from f 7.50 to f 7 in October to f 8.50 in December.

Miscellaneous.

BALIK PULAU, PENANG, AGRICULTURAL SHOW.

The third Balik Pulau Agricultural Show was held on March 30th. and 31st. and April 1st. The last Show in this District was in 1927.

Prizes were awarded for 162 classes, arranged under 9 sections.

The first phase of the Malayan Agri-Horticultural Association Padi Competition was run in connexion with the local padi competition, the best three samples, which were of extremely high quality, being selected for subsequent despatch to the Malayan Exhibition at Kuala Lumpur.

With the exception of fruits, most of which were out of season, all classes were well represented.

The Department of Agriculture staged special exhibits of an instructive nature on mushroom cultivation, the etiolation method of propagating fruit trees, the production of improved copra, and on rat destruction.

The Chairman of the Committee, Mr. A. V. Aston, and those associated with him in this event, are to be congratulated on a most successful show, which it is hoped, will now become an annual affair.

MEETING OF THE AGRICULTURAL ADVISORY COMMITTEE.

A meeting of the Agricultural Advisory Committee of the Department of Agriculture, S.S. and F.M.S. was held at Kuala Lumpur on 14th March, 1934. The Hon'ble the Director of Agriculture was in the Chair. The following are among the more important subjects discussed.

The Coconut Industry.

A resolution for transmission to the Malayan Governments was drawn up as follows:—

" The Advisory Committee of the Department of Agriculture desires to draw the attention of the various Malayan Governments to the present precarious position of the coconut industry and that of other oil crops in this country.

" It considers that the outlook for these industries is extremely grave and it suggests that, especially in view of the large areas cultivated under these crops by small-holders, the matter must be one of serious concern to Government.

" The Committee suggests for the consideration of the Malayan Governments that a useful purpose would be served if His Excellency would appoint a Commission to make full enquiry into the circumstances of the coconut and other vegetable oil producing industries in Malaya with a view to reporting thereon to the Malayan Governments.

"The Committee desires to add that it has had represented to it that, apart from the general disabilities under which these industries are labouring owing to the world economic situation, the copra industry is in particular suffering from unfavourable discrimination by shipping companies in the matter of freight. It suggests that, in the interests of the industry in general and of the small-holders in particular, the position in this respect may be such as to call for special action if this is feasible." (See note on appointment of Committee to investigate Malayan Oil Producing Industries).

The Pineapple Industry.

The meeting was informed that the bill for establishing legislation in regard to the pineapple industry had passed its third reading in the Legislative Council and that steps are being taken to introduce similar legislation in Selangor and Johore. It was agreed that, in order to institute uniformity, legislation in the two latter States should include a clause, similar to that embodied in the S.S. Ordinance, for the establishment of an Advisory Committee which can assist in securing co-ordination in all the administrative areas concerned, and further, that the personnel of this Committee should be identical for these three areas.

The meeting was informed that draft rules and standards for grading canned pineapples has been drawn up and submitted for comments to the various representatives of the trade.

The Chairman reported that a first trial shipment of 88 cases of graded pineapples had been despatched from Singapore with the object of introducing officially graded fruit to the notice of the trade at home.

Report on Coffee Samples from Tanah Rata.

The Committee was informed that the latest report received showed a definite improvement on preceding reports on the samples sent to London and that it is hoped very shortly to better the conditions of manufacture by the addition of new machinery on Cameron Highlands.

Farm Schools at Malacca and Singapore.

The Chairman reported that the proposals for a Farm School at Malacca have been approved by the Resident Councillor, Malacca; they have been referred to the Malacca Committee of the Council and if they are finally agreed upon, the work will be proceeded with during the current year. He stated that similar proposals for the establishment of a school at Singapore had been provisionally approved by the Governor in Executive Council and would be proceeded with this year if the Legislative Council agreed to vote the money.

Mouldy Rot Disease of Rubber.

The Chairman reports that the scheme for distribution to kampong owners of cheap Izal for the treatment of mouldy rot is working very well in Selangor, Negri Sembilan, Pahang, Penang and Province Wellesley, Kedah and in parts

of Perak, and that arrangements are being made for its inception in other States and Settlements.

Among other subjects discussed at the meeting were:—poultry; tea experiments on Cameron Highlands; development of the rice industry; marketing of Malayan bananas; research work on copra; and home garden competitions.

COMMITTEE TO INVESTIGATE MALAYAN OIL-PRODUCING INDUSTRIES.

H. E. The High Commissioner has appointed a Committee consisting of The Hon'ble the Director of Agriculture (Chairman); The Hon'ble the Raja Muda of Perak, M.F.C.; The Director of Co-operation, F.M.S. and S.S.; Mr. J. C. Innes, Manager of the Penang Rubber Estates Co., Ltd., as the S.S. member; Y. M. Ungku Abdul Aziz bin Abdul Majid, as the representative of Johore and Mr. F. C. Cooke (Secretary) with the following terms of reference:—

> "To investigate and report on the present economic condition of the coconut and other vegetable oil producing industries in Malaya and to make recommendations."

AGRICULTURAL SHOWS, 1934.

Balik Pulau, Penang	March 30th. to April 1st.
Kota Bharu, Kelantan	April 19th.
Bukit Mertajam, Province Wellesley	April 20th. and 21st.
Teluk Anson, Perak	April 28th.
Temerloh, Pahang	May 19th.
ELEVENTH MALAYAN EXHIBITION, KUALA LUMPUR	June 2nd. to 4th.
Kuala Selangor, Selangor	August 4th.

Agricultural Shows are also being arranged at the following centres on dates yet to be fixed:—Kajang, Sabak Bernam and Kuala Langat in Selangor, Bentong in Pahang (in August), Mersing in Johore (about June).

In addition to the above, Padi Shows will be held at 46 centres before the Malayan Exhibition, the winning exhibits of each being despatched to the latter Exhibition for further competition.

CORRECTION.

Reference to the article on "A Major Pest of *Derris*" published in the *Malayan Agricultural Journal,* Volume XVIII, No. 11, 1930.

The insect dealt with therein, provisionally determined as *Neolepta biplagiata* Jacoby, has since been described as a new species, the name being *Craniotectus corbetti* Laboissière.

The publication in which this species is described is the "Annales de l'Association des Naturalistes, Levallois-Perret, 20 (1914-31) 1932, pp. 140, 141.

Departmental.

FROM THE DISTRICTS.

The Weather.

April was a normally wet month in most parts of the Peninsula, with a rainfall about or rather above the average. At Cameron Highlands, however, the rainfall was very much in excess of the average for the past five years. In contrast to the generally prevailing conditions, the weather was unusually dry at Lumut in the Dindings, Sitiawan on the Perak coast, along the west coast in Malacca and Johore, and in Singapore island; while on the east coast of Johore and in the Pekan and Temerloh Districts of Pahang, the rainfall was below the average for the month.

Remarks on Crops.

Rubber.—Reports of an international agreement for the restriction of rubber production and their confirmation at the end of the month caused a further rise in prices. The lowest and highest prices in dollars and cents per picul recorded for rubber from small holdings were:—Smoked Sheet $19.20 to $25.50; Unsmoked Sheet $16 to $25; Scrap $4 to $12. The Singapore prices for these grades were $25.50, $23.50 and $9.50 as compared with $22, $20.50 and $7.50 in March. Penang prices for Unsmoked Sheet ranged from $20.50 to $24 as compared with $19 to $22.50 in March.

As was to be expected, the rise in price has resulted in bringing back into tapping almost all the holdings on which the trees are of tappable age. References are made to excessive tapping in some localities, while from Johore and eastern Pahang it is reported that tapping is often done by unskilled women and children with consequent damage to the trees. The use of ladders to give access to tappable bark has been observed in a number of instances in Negri Sembilan.

Leaf mildew on trees just recovering from wintering continued to be fairly widespread in the localities mentioned in last month's report, but was prevented from doing serious damage by the prevailing wet weather. Treatment of bark diseases, especially mouldy rot, continued to improve as also did the general upkeep of small holdings.

Padi.—The price of padi at the Government Rice Mill, Bagan Serai, remained at $1.40 per picul, while private buyers paid $1.20 to $1.30 per picul. The price in Kedah declined and was equivalent to approximately 90 cents to $1 per picul in Kota Star District, while in the Province the range was from about $1 to $1.35 per picul.

The padi harvest has been completed, except in the Sabak Bernam sub-District of Selangor and Kuantan District of Pahang, where reaping was in progress throughout the month. The Krian crop is the best obtained during

the last decade, being roughly estimated at 18 million gantangs. The Bagan Serai mill has already purchased some 12,000 tons of padi. The crops in Kedah and Province Wellesley are known to be very good. In Malacca some 32,250 acres planted yielded 12,360,000 gantangs of padi, a satisfactory feature being the small proportion of padi land left unplanted.

In the Panchang Bedina area in Sabak Bernam sub-District where controlled drainage is being provided, some 5,500 acres of new padi land were planted. Rats did extensive damage to 900 acres but the crop from the remaining 4,600 acres is expected to average 300 gantangs per acre.

In parts of Johore the work of preparing the land for planting was delayed by floods.

Coconuts and Copra.—The average price of copra declined a little further in most localities, ranging from $1 to $2.75 per picul, although a price of $3.50 is recorded from one locality in Kedah. The Singapore price was about $2.30 per picul.

In spite of the very low price, some further progress can be recorded in the preparation of improved copra. Four approved kilns have been completed and are now working in various parts of the Settlement of Penang. With the aid of Government, a kiln has been completed in the Muar District of Johore and a scheme for other Government-aided kilns to be run under the supervision of small local committees is under consideration. A mud-walled kiln at Kuala Pahang is being replaced by a brick kiln. Small-holders appear to be commencing to realise that, in the face of prevailing conditions, it is becoming increasingly necessary for them to prepare copra of good quality if their product is to remain saleable. In this connexion it may be mentioned that work is reported to have stopped on several primitive kilns in Selangor, though the improved kilns continue in use.

Pineapples.—As was anticipated, the supply of fruits increased considerably during the month and the canning factories were kept busy. Prices for fresh fruit in Johore were:—first quality $2, second quality $1.30 and third quality $0.80 per hundred. Corresponding prices in Singapore were $2.60 and $1.40 per hundred.

In the Pontian and Kukub areas of Johore, all available land is being planted up with suckers. The first crop of fruit from the Mandai area in Singapore was being harvested.

A meeting of the representatives of the Pineapple Industry with the Director of Agriculture in Singapore on April 17th. resulted in considerable progress towards the adoption of a grading scheme and the establishment of grading standards for canned pineapples.

Fruit.—In Malacca, mangoes and chikus made their appearance in the markets. Light crops of mangoes, oranges and jambu were obtained in western Pahang and good crops of mangoes and jambu in Johore.

During the month, a further consignment of fresh limes was exported to England from Singapore, the fruit being specially sorted and packed.

Tobacco.—Prices of sun-dried leaves have ranged from \$7 to \$36 per picul according to quality in most parts of the country, thus showing little change; they remained high at \$15 to \$60 per picul in Johore. In Malacca a further rise, giving a range of \$25 to \$40 per picul, has aroused renewed interest in this crop. In Kedah, planting has been commenced with the advent of rainy weather and in the Baling District some 52 acres have been planted.

Cigar leaf, cured about two years ago at the Pineapple Experiment Station in Singapore for a private grower, was kept to mature and sold in April. It had changed considerably in colour, texture and aroma and appeared to be excellent leaf. Reports on its quality were favourable and it sold for \$65 per picul.

Agricultural Stations.

Work on the planting programmes for annual and permanent crops and other routine operations were continued under favourable conditions throughout the month.

The establishment of the Agricultural Station in Labuan has been commenced and good progress has been made in the development of the Kilanas Station in Brunei.

At Selama Station slime diseases destroyed most of the young tobacco and and at the Pineapple Station in Singapore the tobacco crop was severely damaged by stem borers.

At the Tanah Rata Station, Cameron Highlands, a big crop of tea leaf was obtained. The second consignment consisting of 68 half chests containing 4,368 lbs. of tea from this Station was sold in London during the month at an average price of 1/1.75 per lb. This compares with 1/1.35 per lb. received for the first consignment which comprised 111 half chests containing 6,976 lbs. sold in London in November, 1933.

The etiolated shoot method of propagation has so far given rooted shoots of limes, Mandarin oranges and rambutans at the Bukit Mertajam and Selama Stations.

Padi Stations and Test Plots.

A new Caterpillar tractor was received and successfully used for stumping and ploughing on the additional 30 acres of land for experiments in the mechanical cultivation of rice at the Pulau Gadong Station in Malacca.

Nurseries were sown and the land was prepared for planting at six Test Plots in Selangor, Negri Sembilan and Pahang.

The inter-season crop of vegetables at Bukit Merah Station made satisfactory progress, but at the Kendong Test Plot vegetable trials gave little promise of success.

Two new beds of mushrooms at Bukit Merah Station in Province Wellesley fruited as also did another prepared for the Show at Balik Pulau in Penang.

Rural Lecture Caravan.

The Caravan toured Malacca from April the 4th. to 26th. Poultry husbandry and the preparation of improved copra formed the subjects of lectures and demonstrations.

Holiday Course.

A holiday course for boys from the Bukit Mertajam High School was commenced at the Bukit Mertajam Agricultural Station on April 24th. This course which was conducted by the Agricultural Field Officer, Province Wellesley and Penang, lasted eleven days and was attended by 14 boys. Work was confined to the mornings and attendance was purely voluntary. The early part of the morning was allotted to practical work and this was followed by a lecture. The subjects dealt with comprised planting operations, propagation by seed and by vegetative methods, rotation of crops and practical methods of control of pests and diseases of crops. An officer of the Rubber Research Institute of Malaya gave a most useful demonstration of budding rubber in connexion with vegetative methods of propagation. After a lecture on rat destruction, the boys took part in a rat hunt. They were also shown mushroom cultivation and given a demonstration of the construction and use of a copra kiln of approved pattern. The course is considered to have been a success to which the assistance rendered by the Head Master of the Bukit Mertajam High School did much to contribute.

Agricultural Shows and Malayan Padi Competition.

A successful Show organised by the District Economic Board under the Chairmanship of the District Officer, Province Wellesley, was held at Bukit Mertajam on April 20th. and 21st. in the hall of the High School. The first stage of the Malayan Padi Competition was conducted at this Show at which the winning exhibits for despatch to the Kuala Lumpur Show were selected.

The Department of Agriculture staged an exhibit which comprised:—samples of padi illustrating the qualities required for the Malayan Padi Competition, mushroom cultivation, and rat destruction. The Health Department also provided a series of exhibits devoted to rural hygiene.

This was the first Show held in the Province. The quality of the exhibits was good and much local interest was aroused.

A short account of the Agricultural Show at Balik Pulau Penang, will be found elsewhere in this number.

Local competitions in connexion with the Malayan Padi Competition were held in many parts of the country.

DEPARTMENTAL NOTES.

Presentation of Prizes, School of Agriculture.

The distribution of prizes and diplomas to students on the completion of their three years' course of training took place at the School of Agriculture, Malaya, on 19th. April, 1934, the awards being kindly distributed by The Hon'ble Mr. T. S. Adams, British Resident, Selangor.

The Principal of the School, The Hon'ble Dr. H. A. Tempany, C.B.E., in his opening speech welcomed the British Resident and made reference to the Resident's keen interest in and sympathy with, all attempts to broaden and stabilise the basis of Malayan agriculture.

He outlined the history of the School and recalled the difficult times through which the School had successfully passed. In conclusion he paid a tribute to the efforts of the Staff and the keenness of the students.

Mr. G. E. Mann, M.C., Vice-Principal, reviewed the school activities for the past year. He remarked that the change over in the curriculum from a three year to a two year basis for the major course appeared to be justifying itself and pointed out that it had been possible to extend the practical side of the curriculum.

After referring to the keenness and efficiency of the Malayan Volunteer Infantry platoon under the command of Mr. Dawson, he alluded to the activities of the School on the playing field.

The British Resident then distributed the prizes, after which he addressed the students, reminding them of the important part many of them were destined to take in bridging the gap between the research scientist and the raiat. The Asiatic field staff would not find their duties light; it would call not only for technical knowledge, but ability to convert such knowledge into simple language, to back it up by demonstration, and to present it with sympathy and tact. In conclusion, he complimented the School on its successes. His final good wishes to the departing students carried with them the advice not to regard the end of their school life as the end of their education, but rather as the beginning of a somewhat wider type of education.

Tour of the Director of Agriculture.

The Director of Agriculture paid an official visit to Malacca and Singapore between April 13th. and April 18th. On April 14th. he inspected the Stations at Pulau Gadong and Sungei Udang, addressed the Annual General Meeting of the Malacca Planters' Association, conferred with The Hon'ble Resident Councillor and the Agricultural Field Officer. In the evening he attended a demonstration by the Rural Lecture Caravan which was touring the Settlement at the time.

On April 15th. he proceeded to Singapore via Johore, conferring with the Agricultural Officers *en route*.

On April 16th. he conferred with the Agricultural Field Officer, Singapore and with others concerning various questions, and in the afternoon he attended a Conference with the Registrar-General of Statistics.

On April 17th. he visited the Singapore Dairy Farm and the Mandai district. In the afternoon he attended a conference of pineapple packers and exporters at the Singapore Chamber of Commerce, relative to the introduction of grading in the pineapple industry.

He returned to Kuala Lumpur on the 19th. April.

Tours.

Mr. F. C. Cooke, Officer-in-Charge, Copra Investigations, visited the West Coast of Johore, at the invitation of the Johore Government, between 10th. and 15th. April, for the purpose of discussing with officers concerned, proposals for the development of copra manufacture by small-holders and to inspect demonstration kilns under construction.

Transfers.

Mr. W. G. Higgins, Assistant to Statistician, has been transferred temporarily, to the Field Branch, from April 26th., 1934, on which date he proceeded to Kuala Kangsar to act as Agricultural Field Officer, Perak Central.

Mr. J. A. Craig, Principal Agricultural Officer, Kelantan, has been transferred to the School of Agriculture, Malaya, to act as Vice-Principal of the School during the absence on leave of Mr. G. E. Mann.

Mr. N. H. Sands, Acting Agricultural Field Officer, Perak Central, has been transferred to Kelantan, where he will act as Principal Agricultural Officer, during the absence from the State of Mr. J. A. Craig.

Leave.

Mr. G. E. Mann, M.C., Vice-Principal, School of Agriculture, Malaya, has been granted 9 months and 24 days leave on full pay from 27th. April, 1934, to 19th. February, 1935, inclusive.

Mr. R. G. H. Wilshaw, Agricultural Field Officer, returned from leave on April 24th., 1934.

Statistical

MARKET PRICES

April 1934.

Rubber.—The market price of rubber steadily increased during the month, opening at 17⅜ cents per lb. for spot loose in Singapore and closing at 21½ cents per lb. The higher price was caused by the expectation of the early introduction of a measure of restriction of production or exports. The average price for the month in Singapore was 18.75 cents per lb., as compared with 17.18 cents per lb. in March. The average price in April in London was 5.65d. per lb., and 11.94 cents gold per lb. in New York, as compared with 5.18d. in London and 10.87 cents gold in New York in March.

Weekly prices during April for small-holders' rubber at Kuala Pilah, Negri Sembilan; Kuala Kangsar, Perak and Batu Pahat, Johore, were as shewn in Table II.

Palm Oil.—The course of the market is shewn in the following table. Basis 5 per cent. f.f.a.

Table I.

DATE	PALM OIL			KERNELS
	L'Pool/Holland/ Hamburg c. i. f. landed weights in bulk per ton £. s. d.	U.S.A. landed weight per lb. c. i. f. New York/ Philadelphia cents gold	L'Pool/Continent c. i. f. per ton net in barrels £. s. d.	Fair Average Malayan Quality c. i. f. Landed weight per ton on Continent. £. s. d.
April 4	12 15 0	2.45	10 10 0	6 2 6
„ 11	13 10 0	2.45	11 0 0	6 5 0
„ 18	12 15 0	2.30	10 10 0	6 5 0
„ 25	12 15 0	2.30	10 10 0	6 5 0

Copra.—The price of Sundried copra in Singapore remained steady during April, between $2.55 and $2.65 per picul, the average price for this grade being $2.62 per picul as compared with $2.90 per picul in March. The mixed quality averaged $2.15 per picul as compared with $2.31 in March.

Copra cake was quoted throughout the month at $1 per picul.

Rice.—The average wholesale price of Siam No. 2 ordinary rice per picul in Singapore in March was $2.82 as compared with $3.06 per picul in February. No. 1 Rangoon rice averaged $2.47 per picul in March as compared with $2.50

Table II.

Grades	VALUE PER PICUL (dollars)														
	Kuala Pilah, Negri Sembilan.							Kuala Kangsar, Perak.				Batu Pahat Johore.			
	8.3.34	22.3.34	29.3.34	5.4.34	12.4.34	19.4.34	26.4.34	4.4.34	11.4.34	18.4.34	25.4.34	4.4.34	11.4.34	18.4.34	25.4.34
Smoked sheet	20.44	20.30	21.40	22.06	22.17		24.39					21.50	21.27	22.66	23.26
Unsmoked sheet	17.66	19.39	18.67	19.48	15.33	20.77	21.55					†18.00			
Rubber*								2.180	20.57	20.53	22.73		6.80	7.06	
Scrap	6.88	†5.30	6.00	8.96	8.15	8.00	11.84								

† Very small purchase.

* Wet unsmoked sheet.

Transport by lorry Kuala Pilah to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

per picul in February and Saigon No. 1 (long grain) $2.62 in March as compared with $2.60 in February. Corresponding prices in March 1933 were $3.40, $3.05 and $3.32 respectively.

The average retail market prices in cents per gantang of No. 2 Siam rice in March were:—Singapore 23, Penang 26, Malacca 24, as compared with 22, 26, 24 respectively in February and 23, 28, 24 in January.

The average declared trade value of imports of rice in March was $3.11 per picul, as compared with $3.20 per picul in February and $3.30 per picul in January 1934.

Tea.—During March, the London price quoted for Malayan tea was 1s.1d. per lb. Average London prices per lb. during March for tea consignments from other countries were as follows:—Ceylon 1s.3.08d.; Java 1s.0.41d.; Indian Northern 1s.2.14d.; Indian Southern 1s.2.29d.; Sumatra 11.83d.

The London market has been weaker, and although the demand has been good, prices shewed a downward tendency throughout the month.

Tuba Root.—There is a considerable difference between sellers' ideas of prices and those of buyers. In consequence, little fresh business has been transacted. Sold on rotenone-content basis prices have averaged $32.50 per picul, while roots sold on ether extract basis averaged $26 per picul during April.

Coffee.—The Singapore price of coffee shewed a slight upward trend during April: the average price for the month was $20.69 per picul. Palembang coffee rose from $15.25 to $15.75, the average price being $15.62 as compared with $16.20 in March.

Arecanuts.—Supplies of the various grades, with the exception of Bila Whole, are now available. Average prices per picul in Singapore during April were: Splits $2.65 to $4.27; Sliced $7 to $10.95; Red Whole $2.75 to $3.85; Sourabaya Whole, $4.34 to $5.75; Kelantan $3.50 to $3.96, the prices within these ranges depending upon quality.

Gambier.—Block gambier declined 25 cents per picul to $3.75 per picul, the average price for the month being $3.81 as compared with $4.19 in March. Cube No. 1 remained firm at $6.75 as compared with an average price of $6.69 per picul in March.

Pineapples.—Values hardened somewhat towards the end of the month. The London market will not pay the prices demanded by sellers in Singapore. Average Singapore prices per case in April were:—Cubes $3.04, Sliced Flat $2.93, Sliced Tall $3.02, as compared with $3.12, $2.98 and $3.06 respectively in March.

Tapioca.—The Singapore market was dull during the first half of the month, but in the latter part of the month prices were steady at the recent low levels, with more enquiry at the end of the month. Average prices per picul in April were:—Flake Fair $4.19, Pearl Seed $5.39, Pearl Medium $6, as compared with $4.70, $5.80 and $6.38 in March.

Sago.—The trend of the Singapore market was similar to that for tapioca. Average prices per picul in April were:—Pearl—Small Fair $3.74, Flour, Sarawak Fair $1.81 as compared with $3.76 and $1.87 respectively in the previous month.

Mace.—In the latter half of the month, Singapore prices firmed; nominal prices are higher, but sellers will reduce for firm business. Average prices per picul in April were:—Siouw $67.50, Amboina $45, as compared with $65 and $40 respectively in March.

Nutmegs.—The Singapore price for 110's was steady during April at $22.50 per picul, while 80's declined to $23 per picul; the average prices per picul being $23.50. Corresponding average prices in March were $24.25 and $26.75.

Pepper.—Prices in Europe tend to harden, in consequence of which prices improved in Singapore towards the end of the month. Average Singapore prices per picul in April were:—Singapore Black $15.25; Singapore White $29.62; Muntok White $30.12 as compared with $15.69, $29.88 and $30.75 in March.

Cloves.—Prices continued steady and nominal at $35 per picul for Zanzibar $45 per picul for Amboina.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Mackay & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY.*

March, 1934

Malaya.—The imports of foreign rice into Malaya during March were 52,693 tons and exports during the month 10,332 tons. The net imports for the first quarter 1934 were 109,263 tons as compared with 98,448 tons in the corresponding period of 1933, an increase of 11 per cent.

Of the imports during March, 53 per cent. were consigned to Singapore, 15 per cent. to Penang, 4 per cent. to Malacca, 19 per cent. to the Federated Malay States and 9 per cent. to the Unfederated Malay States. Of the total 68 per cent. came from Siam, 28 per cent. from Burma, 3 per cent. from French Indo-China and 1 per cent. from other countries. Of the exports during March 70 per cent. were shipped to Netherlands India and 30 per cent. to other countries.

The various kinds of rice exported were :—Siam 6,358 tons (62 per cent.), Burma 3,335 tons (32 per cent.), Indo-China 263 tons (3 per cent.), Local production 345 tons (3 per cent.) and India 31 tons.

India and Burma.—Foreign exports in February were 122,000 tons as compared with 77,000 tons in January, and with 68,000 tons in January 1933 and 174,000 tons in February 1933.

The total exports of rice and bran from Burma for the period 1 January to 3 March 1934 amounted to 528,728 metric tons as compared with 505,828 metric tons for the corresponding period of 1933, an increase of 4.5 per cent.

Japan.—Latest information available published in the Summary for February 1934.

Siam.—The third and final forecast received from the Department of Commerce, Ministry of Economic Affairs, Bangkok, dated 3rd. April 1934 states that the area planted as at the end of January amounted to 8,100,000 acres, an increase of 100,000 acres as compared with the previous estimate. The area damaged was approximately 600,000 acres. The total outturn was estimated at 3,054,925 tons (rice) and the surplus available for export at 1,440,325 tons (rice).

French Indo-China.—Entries of padi into Cholon January to March amounted to 326,000 tons, this being the same figure as for the corresponding period of 1933. Exports of rice January to March 1934 were 341,000 tons as compared with 362,000 tons for the corresponding period of 1933, a decrease in 1934 of 5.8 per cent.

A report on the Saigon Rice Market for March 1934 states that the market for padi was active in March with a continued decline in prices. Arrivals from the interior have been normal for the time of the year.

Rice prices fell gradually, and during the second half of the month, France remained the only important buyer. From $3 (Saigon) on 1st. March, the price of No. 1 rice fell to $2.86 (Saigon) per 100 kilogrammes at the end of the month. Brokens :—Market firm as a result of poor stocks.

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* Abridged from the Rice Summary for March 1934, compiled by the Department of Statistics, S.S. and F.M.S.

Netherlands India.—Imports of rice in January were 10,822 metric tons, as compared with 35,890 metric tons in January 1933, a decrease of 69.8 per cent. Of these imports 8,804 metric tons were into the Outer Provinces and 2,018 metric tons into Java and Madura.

Ceylon.—Imports for January and February 1934 were 82,674 tons as compared with 71,252 tons during the corresponding period of 1933, an increase of 16 per cent. Of these imports, 15 per cent. were from British India, 70 per cent. from Burma and 15 per cent. from other countries.

Europe and America.—Quantities of rice shipped from the East were:—

(*a*) To Europe: for the period 1st. January to 22nd. March, 170,277 tons as compared with 280,966 tons for the corresponding period of 1933, a decrease of 39 per cent. Of these shipments 26 per cent. were from Burma, nil from Japan, 53 per cent. from Saigon, 61 per cent. from Siam and 5 per cent. from Bengal as compared with the following percentages 39, 8, 44, 8 and 1 respectively in 1933.

(*b*) To The Levant: 1st. January to 28th. February, 1934, 5,327 tons as compared with 4,560 tons for the same period in 1933, an increase of 16.8 per cent.

(*c*) To The West India and America: 1st. January to 28th. February, 11,852 tons as compared with 17,218 tons during the corresponding period of 1933, a decrease of 31.2 per cent.

MALAYAN AGRICULTURAL EXPORTS, MARCH, 1934.

PRODUCT.	Net Export in Tons.				
	Year 1933.	Jan.-Mar. 1933.	Jan.-Mar. 1934.	March 1933.	March 1934.
Arecanuts ...	20,756	5,506	9,749	973	2,035
Coconuts, fresh ...	100,609†	21,609†	21,652†	5,455†	7,108†
Coconut oil ...	17,568	4,636	6,251	1,676	2,384
Copra ...	110,543	20,902	27,499	1,911	10,445
Gambier, all kinds ...	2,560	593	559	199	231
Palm kernels ...	1,983	353	497	154	151
Palm oil ...	12,101	1,102	2,244	540	580
Pineapples canned ...	59,582	12,935	14,289	3,910	5,457
Rubber ...	459,836§	99,304§	124,161§	31,917§	40,751§
Sago,—flour ...	7,648	1,481	3,469	112	2,381
„ —pearl ...	2,646	505	766	157	291
„ —raw ...	4,420*	1,078*	1,080*	361*	312*
Tapioca,—flake ...	9,881	3,055	2,172	1,141	993
„ —flour ...	702*	36	532*	328*	319*
„ —pearl ...	17,297	3,465	3,775	1,047	1,442
Tuba root ...	569½	80	150½	37	44

† hundreds in number. * net imports. § production.

MALAYAN PRODUCTION IN TONS OF PALM OIL AND KERNELS 1st. QUARTER, 1934.

(As declared by Estates).

	Palm Oil		Palm Kernels	
	F.M.S.	Johore.	F.M.S.	Johore.
1934 January ...	926.0	166.3	152.9	30.8
February ...	849.7	129.9	131.6	27.3
March ...	1046.1	220.6	183.0	42.7
TOTAL ...	2821.8	516.8	467.5	100.8

MALAYA RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING MARCH, 1934.

State or Territory	Acreage of Tappable Rubber end 1932 (d)	Estates which have entirely ceased tapping		Estates which have partly ceased tapping		Area of Tappable Rubber never been tapped		Total (3) + (5)	Percentage of (9) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STRAITS SETTLEMENTS :—									
Province Wellesley	44,734	1,323	2.9	7,430	16.6	1,054	2.4	8,753	19.6
Dindings	6,,969	209	3.0	849	12.1	536	7.7	1,058	15.2
Malacca	111,780	4,619	4.1	15,232	13.6	5,582	5.0	19,851	17.7
Penang Island	1,635	623	38.1	176	10.7	177	10.8	799	48.9
Singapore Island	28,269	5,346	18.9	4,764	16.8	566	2.0	10,110	35.8
Total S.S. ...	193,387	12,120	6.2	28,451	14.7	7,915	4.1	40,571	21.0
FEDERATED MALAY STATES :—									
Perak	250,951	3,786	1.5	27,987	11.1	14,426	5.8	31,773	12.7
Selangor	308,379	1,106	0.4	36,424	11.8	13,441	4.3	37,530	12.2
Negri Sembilan	228,541	5,125	2.2	22,061	9.6	16,407	7.2	27,186	11.9
Pahang	38,141	4,819	12.6	3,677	9.6	6,396	16.8	8,496	22.3
Total F.M.S. ...	826,012	14,836	1.8	90,149	10.9	50,670	6.1	104,985	12.7
UNFEDERATED MALAY STATES :—									
Johore	325,747	15,549	4.8	31,882	9.8	21,293	6.5	47,431	14.5
Kedah (a) (b)	126,588	3,595	2.8	9,556	7.6	(e) 5,700	4.5	13,151	10.4
Kelantan	21,176	2,080	9.8	2,294	10.8	3,591	16.9	4,374	20.6
Trengganu (c)	4,643	Nil	Nil	1,609	34.6	200	4.3	1,609	34.7
Perlis (a) (b)	957	106	11.1	131	13.7	308	32.2	237	24.7
Total U.M.S. ...	479,111	21,330	4.4	45,472	9.5	31,092	6.5	66,802	13.9
TOTAL MALAYA ...	1,498,510	48,286	3.2	164,072	10.9	89,677	6.0	212,358	14.2

Notes :—(*a*) Registered companies only and are rendered quarterly.

(*b*) The figures quoted for Kedah and Perlis are those for end December 1933, and Kelantan end January, 1934 Revised figures will be published when available.

(*c*) Registered Companies only.

(*d*) Figures for end December 1933, are not yet available.

(*e*) Estimated: figures not yet available.

MALAYA RUBBER STATISTICS TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF MARCH, 1934 IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
	Ports	Dealers	Estates of 100 acres and over	during the month	January to March inclusive 1934	during the month	January to March inclusive 1934	during the month: Foreign	during the month: From Malay States & Labuan	January to Mar. inclusive 1934: Foreign	January to Mar. inclusive 1934: From Malay States & Labuan	during the month: Foreign	during the month: Local	January to Mar. inclusive 1934: Foreign	January to Mar. inclusive 1934: Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States ...	...	15,490	11,345	11,231	34,735	11,551	32,492	Nil	Nil	Nil	Nil	16,530	6,916	48,361	18,105	...	16,339	9,813
Johore ...	...	3,935	3,294	3,492	10,765	4,178	13,909	Nil	3	Nil	13	1,565	6,879	4,774	19,942	...	3,404	3,054
Kedah ...	...	384	2,352	2,518	8,410	1,447	5,046	Nil	Nil	Nil	Nil	1,660	2,896	4,559	9,584	...	323	1,822
Perlis ...	...	22	15	14	43	41	109	Nil	Nil	Nil	Nil	Nil	64	Nil	167	...	14	14
Kelantan ...	...	382	261	181	665	1,236	2,722	Nil	Nil	319	Nil	114	1,269	260	3,187	...	553	124
Trengganu ...	...	55	50	221	619	111	308	Nil	Nil	Nil	Nil	Nil	332	Nil	927		55	50
Total Malay States	...	20,268	17,317	17,657	55,237	18,564	54,586	Nil	3	319	13	19,869	18,356	57,954	51,912	...	20,688	14,877
STRAITS SETTLEMENTS :-																		
Malacca ...	...	3,427	1,182	1,312	4,010			1		2		3,170		10,69[illegible]		...	3,812	992
Province Wellesley	...	926	543	477	1,632			Nil		Nil						...	1,871	435
Dindings ...	...	58	152	107	326	2,451	7,823	Nil	16,375	Nil	49,655	8,308	Nil	25,354	Nil	...	74	133
Penang ...	3,116	5,877	9	8	37			2,412		6,089						1,090	6,928	6
Singapore ...	4,961	34,215	159	175	510			17,494		44,652		27,168		77,43[illegible]		6,841	38,608	144
Total Straits Settlements	8,077	44,503	2,045	2,079	6,515	2,451	7,823	19,907	16,375	50,743	49,655	38,646	Nil	113,48[illegible]	Nil	7,931	51,293	1,710
TOTAL MALAYA	8,077	64,771	19,362	19,736	61,752	21,015	62,409	19,907	16,378	51,062	49,668	58,515	18,356	171,437	51,912	7,931	71,981	16,587

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
20	21	22	23	24	25	26
DRY RUBBER	12,207	31,838	5,955	4,587	1,569	100
WET RUBBER	4,132	6,770	973	1,170	1,835	223
TOTAL ...	16,339	38,608	6,928	5,757	3,404	323

TABLE III
FOREIGN EXPORTS

PORTS	For month	January to March 1934
Singapore ...	37,918	109,537
Penang ...	13,535	40,291
Port Swettenham.	6,215	19,245
Malacca ...	847	2,364
MALAYA ...	58,515	171,437

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January to March 1934
Malay States ... / Straits Settlements	41,048	123,444
MALAYA ...	41,048	123,444

Notes:—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] −[2]−[3]−[4]−[5]−[9]−[10]. For the Straits Settlements, Columns [7] and [8] represent purchases by dealers from local estates of less than 100 acres, reduced by 15 % to terms of dry rubber.

3. Foreign imports as published in Return I. & E. 5, wet imports being reduced to dry weight by 25% except those from Netherlands India which are reduced by the official percentages shown in Schedule I.

4. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.

5. Domestic exports are estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign exports of the later month, the foreign exports of the Malay States being domestic production.

6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 25th April, 1934.

Locality	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total	Total	Most in a day Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total	Daily Mean	Per cent
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.								
Railway Hill, Kuala Lumpur, Selangor ...	90.6	71.3	80.9	95	68	84	74	83.4	84.1	13.98	355.1	4.25	25	22	7	5		157.00	5.06	42
Bukit Jeram, Selangor ...	87.4	71.8	79.6	91	69	84	75	83.5	85.0	10.34	262.6	1.40	23	19	5			184.55	5.95	49
Sitiawan, Perak ...	88.5	72.4	80.5	93	70	85	75	83.1	83.8	14.13	358.9	2.82	16	13	3	1		193.80	6.25	52
Temerloh, Pahang ...	87.2	71.9	79.5	93	69	79	75	83.0	84.0	7.89	200.4	1.82	19	18		1		156.95	5.06	42
Kuala Lipis, Pahang ...	86.7	71.4	79.1	92	69	78	74	82.5	82.7	7.13	181.1	2.12	20	16	1	15		138.85	4.48	37
Kuala Pahang, Pahang ...	83.9	73.8	78.9	89	71	78	78	82.4	82.5	11.04	280.4	2.56	18	14	1		1	189.15	6.10	50
Mount Faber, Singapore ...	85.5	71.8	78.7	90	69	73	75	79.4	80.1	10.65	270.5	4.38	22	15	3	1	2	159.70	5.15	43
Butterworth, Province Wellesley ...	88.0	72.6	80.3	91	70	84	75	83.7	84.5	7.62	193.6	2.00	15	14	4			208.95	6.74	56
Bukit China, Malacca ...	84.6	72.8	78.7	89	69	76	76	81.2	82.0	11.74	298.2	5.85	18	13	1		2	156.25	5.04	42
Kluang, Johore ...	86.2	71.2	78.7	92	68	75	74	80.1	80.2	15.62	396.8	7.31	21	16		4		155.35	5.01	41
Bukit Lalang, Mersing, Johore	83.5	72.4	77.9	90	70	79	75	79.9	79.5	9.21	233.9	1.25	17	15	1	2	2	187.80	6.06	50
Alor Star, Kedah ...	90.8	71.5	81.1	93	69	87	73	84.0	84.0	2.95	74.9	1.20	16	10	13	3		228.65	7.38	61
Kota Bahru, Kelantan ...	86.4	72.7	79.5	91	70	80	77	81.9	82.4	3.07	78.0	0.86	13	10				199.30	6.43	52
Kuala Trengganu, Trengganu	85.0	72.5	78.7	89	69	79	76	81.2	81.7	3.87	98.3	1.33	13	11		3	1	197.40	6.37	53
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. Pahang ...	71.6	61.6	66.6	79	60	63	64	69.9	70.1	12.80	325.1	2.88	22	19	1	14	1	105.65	3.41	28
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.2	56.2	63.7	76	51	65	61	68.1	68.2	13.27	337.1	2.05	20	20	1	1	1	103.25	3.33	27
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	70.2	58.8	64.5	75	57	65	61			13.78	350.00	2.45	25	22		1	1	114.60	3.70	30

Compiled from Returns supplied by the Meteorological Branch, Malaya

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The Agricultural Economist.

THE

Malayan Agricultural Journal.

JUNE. 1934.

EDITORIAL.

Marketing Fruit.

The organisation of the marketing of fruit in Malaya has long been recognised as a problem of considerable difficulty, by reason of the fact that there are few economic areas under one variety, fruit trees of numerous varieties are very scattered and many areas are not readily accessible to market centres. For these reasons, and also on account of the necessity for good marketing and transport facilities, fruit cultivation is apt to languish and be restricted to the provision of supplies for sale in the immediate neighbourhood in which they are grown.

While the above is generally true of Malayan conditions, it is not forgotten that there are exceptions; notably, the marketing of fresh pineapples from the extensive areas in Johore and to a less extent in Selangor; bananas from certain areas in Negri Sembilan and elsewhere and duku and other fruits from the old-established orchards in Malacca.

The organisation of fruit marketing demands a precise knowledge of the extent of the planted areas and the kinds of fruits grown thereon throughout the producing districts and an efficient system of marketing intelligence. Given this organisation, it may become possible to arrange distribution of fresh fruits to markets in which there is a shortage of supplies—although such shortage may be of but a temporary nature.

Furthermore, the marketing locally of fresh fruits in good condition necessitates adequate and rapid transport facilities. This fact handicaps the marketing of fruit from the less accessible areas, on account of time taken in bringing the produce to market and expense of transport.

The present organisation of the Department of Agriculture precludes any extensive work being undertaken on the organisation of the marketing of fruits. As a preliminary, however, a survey is being undertaken regarding the kinds of fruits grown in different areas, the amount of surplus fruit available from time to time and the present marketing methods. A survey of the areas in Malacca was undertaken some time ago and the result published in this journal in February 1933. In the present number will be found a record of a somewhat similar survey of the areas in Pahang. It is hoped that the survey may

be extended to other States in which fruit is at all widely grown. These records will serve as a basis for consideration of organising greater facilities for marketing fruits in the most favourable markets.

Attention is also drawn to an account in this number of an enquiry into the marketing of fresh bananas in the United Kingdom and Australia. It is concluded that on account of distance from the market, transport difficulties and the existance of sources of supplies more favourably situated, there is at present no likelihood of markets developing for Malayan bananas in these centres.

Field Experiments.

Included in the present number is an article setting forth the standard methods used in laying out field experiments. This Department frequently cooperates with estates in the conduct of experiments. Such experiments are normally devised and supervised by a scientific officer, but the actual conduct of the work and the harvesting of the crops is frequently in the hands of the owner or manager of the property. The success of the work depends on the amount of care and supervision which the man on the spot can give, and we take this opportunity of recording our grateful thanks to the numerous practical men who have assisted us in this respect from time to time.

In order that field experiments may be critically examined, it is essential that the standard methods be closely followed. Much experimental work by non-technical men—and let it be acknowledged, by technical bodies too—has proved useless because the investigator has not taken precautions to obviate variations in results due to factors other than those under investigation.

It is thought that the account here given will be acceptable to those who kindly assist us in our investigations and may be of use to others who desire to undertake independant investigations with field crops.

Diseases of Tobacco.

Included in this number is an article which summarises our present knowledge of diseases of tobacco in Malaya. On account of the increasing area under cultivation with this crop in Malaya, diseases assume greater significance. By the nature of these diseases, especially of slime disease, it is most important that the grower should take precautions against their spread; neglect in this respect may seriously prejudice the industry in the future. Adequate control necessitates early recognition of the symptoms, and for this reason, the notes on this subject, which we here publish, are commended for the close attention of cultivators.

In passing, readers are reminded that an article dealing with the insect pests of tobacco in Malaya was published in this Journal in February, 1933.

Original Articles.

DISEASES OF TOBACCO IN MALAYA

BY

A. THOMPSON,

Government Mycologist.

Introduction.

The tobacco plant is subject to many diseases caused by the attack of parasitic fungi and bacteria, and there is considerable information available from tobacco-growing countries relating to these maladies. In Malaya, where interest in the cultivation of this crop is of recent date, information regarding local diseases is as yet scanty.

Two of the most prevalent diseases are slime disease and leaf spot. In addition to these diseases which are caused by micro-organisms, some diseases of obscure nature have been recorded from time to time. In these cases, the trouble may take the form of malformations of the leaves, chlorosis (yellowing) or mottling, and while, in some instances, it is probable that a disease of the nature of a virus disease, such as ordinary "mosaic" disease, is responsible, in other cases it is probable that the abnormalities are due to deficiency in an element or elements of plant food, or to environmental conditions.

Slime Disease.

This disease is the most serious disease of tobacco plants in Malaya.

Symptoms.—Some of the leaves on a plant infected with slime disease begin to wilt and during the hotter part of the day will hang limply down the stem. During the night these leaves may recover their turgidity to a certain extent, but on the following day they will again wilt and every day a larger number of leaves will show similar symptoms until in about one week all the leaves and the top of the stem are wilted and the plant finally dies.

The stems of affected plants may not exhibit any abnormal symptom in the early stages of the disease, but as the disease progresses, a brown and finally a black discolouration becomes evident in the tissue of the stem.

The roots of diseased plants may not appear to be diseased, but when the disease becomes evident in the leaves some of the roots may be discoloured brownish-black and the tips may be decayed.

If the stem of a diseased plant is cut across close to the ground, there is usually a brownish ring present just beneath the epidermis, in the vascular system. In very early stages of the disease, this brown ring may not be developed, but when several leaves have wilted it is normally present. On squeezing the cut stem, a dirty-white slime exudes from this ring, especially in fairly advanced cases.

This slimy fluid contains millions of bacteria which plug the food-conducting vessels in the stem and roots, thus interfering with the circulation of the sap. The bacteria also produce a toxic substance and this, combined with the plugging of the vessels, causes the plants to wilt.

The organism.—The organism, which lives in the soil, is a short-rod bacterium—*B. solanacearum* E.F.S; it has been recorded as a parasite of many species of plants. In addition to attacking tobacco, the organism is the main cause of the well-known wilt of tomato plants in this country, while it is also known to attack groundnut, brinjal, arrowroot, chilli, petunia, and potato and possibly can attack many of the local species of *Solanaceae*.

The Disease in the Nurseries and in the Field.—The bacterium enters a plant by means of the roots, probably through small wounds, and multiplies rapidly in the vascular system, secreting substances that are poisonous to the plant. Plants may be attacked at any stage of growth, but very young seedlings are rarely affected. When the plants in a nursery bed are ready to transplant, some of them may show signs of infection, but frequently the disease does not appear until the plants have been transplanted into the field. Jochems (1) states that this seed-bed infection usually appears in the nurseries when the roots of the older seedlings have penetrated into the lower unsterilized layers of soil. In seedlings taken from infected nurseries, symptoms of the disease may appear within a few days after transplanting, whereas if healthy seedlings are planted in infected soil, 3 to 4 weeks may elapse before the first symptoms appear.

The disease can spread from infected plants to adjoining healthy plants which may not show the symptoms for some weeks. Consequently, although the initial mortality in a plot of young plants may be slight, a few weeks later many of the plants may become affected. In some plants of the Joyner variety grown locally, the disease appeared just before the plants were topped. A knife was used for topping and within a few days it was noticed that a black discolouration was extending down the cut stem and passing into the lower leaves of formerly healthy plants. It is probable that the knife became infected through cutting a diseased stem and thus transmitted the infection to healthy stems.

When an area is planted with tobacco for the first time, slime disease may not appear unless the land had been used recently for the cultivation of other susceptible host plants. If the tobacco crop shows no infection and if the land is cleared of the old plants when the crop is harvested, it is often possible to grow other crops of tobacco until the disease appears.

When the disease appears, the mortality may be as low as 10 per cent. in the first crop, but subsequent crops may be completely wiped out and the land cannot be used again for tobacco cultivation until it has been allowed to lie fallow for some years, and specially treated so as to suppress solanaceous weeds.

(1) Jochems Dr. S. J. Med. v.h. Deli Proefstn. 43. Ser. 2. 1926.

If susceptible host plants are not permitted to grow in infected soil, the bacterium loses virulence after a period of some years and a crop of tobacco can again be obtained.

In Netherlands India where there are large areas under tobacco cultivation and where slime disease has caused considerable damage, it is the practice to adopt a seven-or eight-year rotation, sometimes with rice and maize which are immune from the disease, or with *Mimosa invisa* which helps in suppressing susceptible species and is itself immune.

So far as is known, all varieties of tobacco can be attacked by slime disease. The varieties on which the disease has been recorded in Malaya are—Deli, Burmese, Joyner, Hickory Prior, White Burley, Russian, Bhengi, and Ceylon.

The problem of controlling soil-borne diseases is always difficult and expensive, when varieties resistant to the disease are not available. So far, no strains of tobacco fully resistant to slime disease have been discovered or produced by selection or breeding.

Slime disease is said to be more virulent on some types of soil than on others. According to Jochems, (*loc. cit*) crops growing in red laterite soil nearly always suffer badly from slime disease, but it is not yet clearly ascertained to what properties the enhanced liability of some soils to this disease is due.

Control Measures: *Prevention.*—It is very desirable that land which is free from slime disease should be protected, as far as possible, from becoming infected. Infection is certain if diseased seedlings are planted, and consequently one of the most important preventive measures is to sow the seed in nursery beds of sterilised soil, or in soil which is known to be free from the disease. Seedlings from infected nurseries should not be planted in the field.

One method of sterilising infected soil in nursery beds is by steam. Chemical disinfectants have so far been found of little use, not only on account of the cost and the difficulty of application, but also, in some cases, on account of inefficiency.

In order to steam-sterilise a seed-bed, a portable boiler and an inverted pan made of re-inforced galvanised iron can be used. The size of the pan varies according to requirements, a convenient size being 6 feet by 12 feet by 8 inches high. The pan is placed over the soil and pressed into it and steam is passed into the pan through a hose pipe at a pressure of about 80 lbs. per sq. in., by means of an inlet in the top of the pan, and the soil is steamed for about 30 minutes. The pan is then moved along the seed bed until all the soil has been steamed.

Steam sterilisation, however, is considered to be an impracticable method on the large nursery areas of the tobacco estates in Sumatra and it is out of the question for small-holders to adopt this method.

The practice of burning brushwood and grass on the surface of the soil of the seed bed is only partially successful, and better results would probably be obtained if the top soil could be removed, the lower layers surface fired, and the top soil fired when it is replaced on the bed. At present this appears

to be the only practicable method of soil sterilisation available for small-holders. In addition, the seed-bed should be raised so that contamination, by rain water flowing from adjoining and possibly infected soil, would be minimised.

On larger properties, the site of the nurseries should be changed frequently. After the seedlings have been removed, the soil should be fired and kept free from susceptible weeds by planting with a cover such as *Mimosa invisa* and allowed to lie fallow for as long a period as possible.

If seed-boxes are used for the growing of seedlings, the boxes should be discarded or else washed, inside and outside, with a disinfectant; *e.g.* 5 per cent. Izal, before they are used again.

Control in the Field.—Local experience with tobacco cultivation has shown that there is reason to expect that slime disease can cause as serious damage in Malaya as it has caused in Netherlands India, and in certain other countries. As mentioned above, the practice of rotation with rice and maize as well as *Mimosa invisa* over a period of seven to eight years is considered necessary in the large tobacco areas in Sumatra, and the possibility that a similar practice will be found necessary in Malaya should be borne in mind, if the establishment of any large areas devoted to tobacco cultivation is contemplated.

In the case of tobacco cultivation by small-holders, the problem is complicated by the small size of the holdings. Many small holdings are as yet free from the disease, but on holdings where it has occurred the mortality has been heavy.

When the disease makes its appearance, the infected plants should be dug out as soon as they are observed, removed to a safe place and burnt.

If diseased plants are not removed, the adjoining plants will almost certainly become affected, whereas there is a chance of saving healthy plants if diseased plants are quickly removed. It is also advisable if only a few plants are affected, to remove the soil beneath diseased plants and to discard it in a safe place, taking care to avoid scattering it in the planted area during removal. If possible, on small plots the soil should be fired; solanaceous crops should not be planted or permitted to grow in this soil for as long a period as possible.

Plants grown in badly-drained soil are more likely to become infected than those in well-drained soil. Consequently, it is important that the land should be adequately drained. Drainage alone will not eradicate the disease, but the number of casualties is frequently less on well-drained soil.

Finally, it is very important that all the old tobacco stalks should be removed from the land, and burnt, as soon as possible after harvest.

Leaf Spot.

Tobacco plants in Malaya are very frequently affected by a leaf disease caused by the fungus *Cercospora nicotianae* Ell and Ev.

The spots are at first small and round, brownish in colour and are first noticed on the older leaves. Later, some of the spots may coalesce and they gradually become white in the centre, concentrically zoned and finally dry up.

The disease is not regarded as serious in this country, since little damage is caused except when the leaves are intended for use as cigar or cheroot wrappers. In Rhodesia, however, the disease is said to lead to black spotting in the barns on flue-cured varieties.

Control.—Early removal and burning of the lower, infected leaves will keep the disease in check. Burgundy mixture sprayed on to the leaves of young plants is also beneficial.

Mosaic Disease.

Mosaic disease is an infectious disease which is readily transmissible to healthy plants from diseased plants. It belongs to the group of diseases known as virus diseases, and is due to the attack of a parasitic micro-organism.

The most characteristic symptom is a mottling of the leaves with irregular patches of light green and dark green, sometimes accompanied by blistering, curling, and distortion of the leaves.

The effect of the disease is to reduce the yield and quality of the leaf.

The disease is not seed borne, but it may appear in the nursery beds and, since it can be transmitted merely by touching a diseased plant and then touching a healthy plant, it may be spread to a number of plants during transplanting.

The disease is spread in the field mainly by handling when priming is first done, or when the plants are being examined for the presence of leaf-eating caterpillars.

Symptoms of the disease are not produced in the leaves already formed on a plant at the time the infection occurs, but appear in the leaves formed subsequent to infection, or in the suckers formed after topping. Nevertheless, the infection is present in all parts of the plant, except the seeds.

The infective principle can persist for years in dried tobacco leaves, and is not rendered inactive during the manufacturing process. Consequently, infection can be transmitted by workers using infected tobacco or snuff.

Fortunately, the disease does not infect the soil in which affected plants have been grown.

Control.—The symptoms of mosaic disease in infected seedlings are not very marked, and it is not always possible to ensure that all infected seedlings have been removed from the seed-bed before transplanting begins.

Prevention of seed-bed infection is, therefore, an important measure. This is best accomplished by locating the seed-beds at some distance from areas where tobacco is growing, by keeping down weeds in the seed-bed and in the neighbourhood of seed-beds, since some of these weeds may be susceptible to mosaic disease and it may spread to the tobacco seedlings. Muslin covers used on seed-beds should be boiled and dried before they are used again. All tobacco stumps and refuse should be removed from the land after harvest, so that infected plants will not be a danger to nearby seed-beds.

If the disease is found in the seed-bed, the infected plants and those in immediate contact with the infected plants should be carefully removed and burnt. The hands of the workers should be well washed and dried, immediately this is completed, and they should not handle the healthy seedlings when removing the infected plants. If there are numerous cases of mosaic infection in a seed-bed, it is advisable to destroy all the seedlings and obtain supplies from elsewhere.

In the field, infected plants should be removed quickly and carefully before the workers begin to handle the plants when looking for caterpillars.

General.

The diseases mentioned above are the only ones so far investigated on tobacco in Malaya. It is almost certain that others occur, but they have not yet been definitely recorded.

Among the diseases which may be expected to appear the following are the most important.

(*a*) Damping-off of seedlings caused by Fungi. *Rhizoctonia solani* causes a disease in which patches of seedlings die off and are attached to the soil by whitish-yellow mycelium which looks like a spider's web, and which can be seen in the early morning. *Phytophthora* sp. also kills very young seedlings in patches. In older seedlings the fungus may appear on isolated plants the stems of which turn jet-black, but do not exude slime when squeezed. These diseases can be controlled by spraying the seedlings periodically with weak Bordeaux (or Burgundy) mixture to which it is advisable to add 1 per cent. solution of lead arsenate to assist in controlling caterpillars. It is also important to prevent waterlogging of the soil, and to permit sunshine and air to have access to the plants.

(*b*) Stem Scorch.

Stem scorch caused by *Phythium* spp. is a disease which attacks the stems of the plants just below soil level, causes them to rot and the plants to fall over, or wither. The stem is markedly constricted at the point of attack.

The disease is only serious in wet weather, and on land on which plants of *Leucaena glauca* or *Phytolacca octandra* have been growing for some time.

The dead plants should be lifted and destroyed and replaced by seedlings which are older than those normally used for transplanting, and watered only once directly after planting. The planting hole should be deeper than usual and should not be filled in for about a week.

(*c*) Collar disease caused by *Sclerotium Rolfsii.* This disease usually appears soon after transplanting and corrodes the bark in as far as the wood of the stem just at and below soil level.

The disease is easily identified by the white mycelium, covered with small, white or brown sclerotia, which is attached to the stem.

The disease is said to cause little damage, but it is likely to be more serious in land formerly used for the cultivation of Jerusalem artichoke, or groundnuts.

(*d*) VARIEGATED LEAVES. Sometimes plants appear with variegated spots in the leaves, so that occasionally the leaves are almost white. These leaves remain variegated during and after curing and so are valueless. The phenomenon is hereditary and consequently seed should not be collected from such plants.

Summary.

Some local diseases of tobacco are described and control measures recommended.

Brief mention is made of diseases which have not yet been recorded in Malaya, but are probably present and are likely to require investigation if tobacco cultivation extends.

SURVEY OF CULTIVATED FRUITS IN PAHANG 1933

BY

J. W. JOLLY,

State Agricultural Officer, Pahang.

Towards the latter part of 1932, a preliminary fruit survey was conducted in the District of Temerloh, Pahang. In this instance one holding only was examined from each mukim.

As a result of the information obtained, it was decided to extend operations during 1933 to embrace all Districts in Pahang and, where possible, to increase the number of holdings examined to four from each mukim. At the same time, a census of cultivated fruits was undertaken and has revealed the presence of a very much larger acreage than that previously estimated.

Methods Employed.

Pahang is divided into six administrative districts, each of which has been examined separately. A total of 224 holdings were inspected, representing an average of slightly less than four holdings from each mukim.

The distribution of number of holdings examined is as follows:—Lipis 56, Raub 28, Bentong 12, Temerloh 60, Pekan 60, Kuantan 8.

A field form similar to that utilized for the Malacca Survey was prepared, but it was found necessary to apply certain modifications to meet local conditions.

Each of the holdings selected was examined by the Malay Agricultural Assistant in charge of the District, who recorded the information on the field forms. Re-surveys were performed from time to time in order to check the work as a result of which it was found that the information recorded was reasonably accurate.

Information Sought.

The principal information sought was as follows:—

(*a*) The average size of fruit holdings and to what extent acreage varies according to proximity to market.

(*b*) An accurate estimate of the actual acreage of cultivated fruits.

(*c*) The average yield per acre of the various cultivated fruits.

(*d*) The estimated cash return per acre from the various Districts.

(*e*) General condition of cultivation.

(*f*) To obtain information as to what districts would be most likely to benefit from increased fruit cultivation.

(*g*) Districts from which a surplus of fruit is invariably produced.

(*h*) Districts which produce insufficient or only just sufficient fruit to satisfy their own requirements.

(*i*) What marketing facilities exist for the disposal of surplus fruits.

In newly planted holdings more attention is paid to cultivation and this may be attributed largely to the practice of cultivating catch crops such as banana, pineapple, sugar cane, tapioca and miscellaneous vegetables during the early growing period of the main crop.

As a result of the census of areas of cultivated fruits taken, excluding coconuts, pineapples and bananas, it has been found that very great discrepancies have occurred in past returns, the total planted acreage being 4117 acres as against the previous estimate of 1065 acres.

There is some considerable variation in yields per acre of the cultivated fruits as amongst districts and it is not considered that, in many cases, this information can be treated as being more than very approximate. Considerable difficulty was experienced in obtaining any information on this matter as cultivators generally appeared unable rather than unwilling to estimate past returns. In order to obtain reasonably accurate yield figures, a smaller number of holdings have been selected from each district and actual yields are to be recorded over a period of years.

General Information Obtained.

Size of Holding and Density of Planting.

Practically all Malay holdings possess a few varieties of fruit, but fully-planted holdings are, as a rule, only met with in Districts situated in close proximity to a ready market.

The fruits most commonly planted are shewn in Table II. The number of holdings on which the chiku, (*Achras sapota*), pulasan, (*Nephelium chryseum*) and duku, (*Lansium domesticum*) were found under cultivation was so small as to render impossible the inclusion of these types amongst the local cultivated fruits. These fruits find a ready local market and there is room for a limited expansion in their cultivation.

The size of holdings varies from under 2 to 4 acres, but is usually between 2 and 3 acres in extent. Proximity to a market does not necessarily mean larger holdings as is shewn by the fact that the average size of holding in Bentong situated near to a ready market is 2 acres, while in Lipis with a less ready market, the average size of holding is 2.25 acres. The average size of holding in other Districts is as follows:—Raub 2.25 acres, Temerloh 1.75 acres, Pekan 4 acres, Kuantan 2.75 acres.

The larger average size of holding shewn for Pekan is due to the inclusion of a number of relatively large holdings situated in the vicinity of the town of Pekan, and it must not be assumed that holdings in this District are generally larger than obtain in other Districts.

In areas situated close to markets, the density of cultivation is much greater than is the case in holdings not so favourably situated.

Condition of Holdings.

Planting is usually of a haphazard nature and, undoubtedly, a very considerable number of trees in the older plantations are self-sown. On more recently planted holdings, however, attention has been paid to lining and holing.

With a few exceptions, fruit holdings once established are almost entirely neglected, no cultivation in any form being practised. In some instances, however, new plantings receive some care during the early stages of growth. Excessive undergrowth is periodically cut back and, in some cases, attempts are made to protect the crop from the ravages of pests, such as squirrels. Manuring is seldom practised on mature holdings, except where livestock are allowed to roam over the holdings and thus to supply a small amount. Rubbish, grass cuttings and ashes are, in some cases, used to fertilise new plantings.

Knowledge of marcottage is fairly general, but with a few exceptions, has not been practised to any large extent.

The demand for good fruit stock is increasing, but the actual number and variety of plants ordered indicate that cultivation is intended for home consumption rather than for marketing purposes.

Marketing.

Most surplus fruit, if sold, is disposed of at the roadside to travelling dealers. The unit of production, with few exceptions, is too small to allow of good prices being obtained, but in the case of roadside sales, this is sometimes overcome by producers arranging to take their produce to a definite place on a certain date, thereby obviating the necessity for a dealer to visit several places before he can obtain sufficient supplies to meet his requirements.

Marketing facilities are extremely poor and the producer is entirely at the mercy of the buyer, but it must not be overlooked that the buyer in Pahang often takes greater risks than is the case in other parts of the country. As an example, lorry drivers returning to Kuala Lumpur with only a small load or no freight at all, often purchase considerable quantities of fruit, which they hope to sell at a profit on arrival in Kuala Lumpur.

The practice of bringing all produce to certain places along the roadside for sale results in slightly better returns to the producer, as the purchaser can than obtain his requirements from one or two centres and thus save both time and money. No attempt at co-operative selling is undertaken in conjunction with this form of collective selling, each cultivator disposing of his own produce, but the mere fact that the purchaser has a number, instead of one individual to deal with, reacts to the benefit of the producer.

The formation of "Weekly Fairs" has improved the marketing facilities. This is most noticeable in the case of the very small producer, whose crop would be insufficiently large to warrant the expense of transporting it to any of the larger markets. Retail prices in the local town and village markets are invariably higher than prices at "Weekly Fairs".

Table I.

Order of Popularity of Fruits as amongst Districts and Percentage of the Total Holdings on which Individual Fruits are Planted.

LIPIS		RAUB		BENTONG		TEMERLOH		KUANTAN		PEKAN	
	%		%		%		%		%		%
Coconut	94	Rambutan	100	Banana	91	Coconut	100	Mango	87	Coconut	96
Langsat	91	Durian	96	Jack Fruit	91	Jack Fruit	78	Rambutan	75	Mango	83
Durian	87	Banana	93	Coconut	83	Rambutan	75	Durian	75	Jack Fruit	76
Rambutan	82	Coconut	89	Rambutan	83	Mango	68	Rambai	75	Rambutan	71
Jack Fruit	78	Langsat	89	Durian	83	Banana	66	Coconut	50	Mangosteen	68
Mangosteen	75	Mangosteen	85	Mango	75	Mata Kuching	56	Mangosteen	37	Banana	68
Bachang	64	Bachang	78	Mangosteen	66	Langsat	53	Jack Fruit	37	Rambai	66
Mata Kuching	64	Mata Kuching	78	Pineapple	66	Durian	50	Bachang	37	Jering	56
Mango	63	Jack Fruit	75	Bachang	66	Bachang	46	Langsat	25	Bachang	53
Pomelo	60	Rambai	71	Jering	66	Mangosteen	41	—		Durian	50
Jering	53	B. Buloh	60	Langsat	58	Rambai	41	—		Pineapple	33
Blimbing Buloh	52	Jering	57	Rambai	58	Pomelo	33	—		Pomelo	31
Rambai	51	Pomelo	50	B. Buloh	50	B. Buloh	33	—		B. Buloh	20
Banana	50	Mango	39	Pomelo	50	Jering	21	—		Langsat	10
Pineapple	25	Pineapple	25	Mata Kuching	33	Pineapple	16	—		Mata Kuching	6

Table II.

Fruit Survey, Pahang.

Average stand of fruit trees and estimated yield and cash value of crops.

Name of Fruit	Yield stated in terms of	LIPIS DISTRICT Average Number Plants Per Acre	LIPIS DISTRICT Average Yield Per Acre Per Annum	LIPIS DISTRICT Gross Cash Value Per Kampong $	RAUB DISTRICT Average Number Plants Per Acre	RAUB DISTRICT Average Yield Per Acre Per Annum	RAUB DISTRICT Gross Cash Value Per Kampong $	BENTONG DISTRICT Average Number Plants Per Acre	BENTONG DISTRICT Average Yield Per Acre Per Annum	BENTONG DISTRICT Gross Cash Value Per Kampong $	TEMERLOH DISTRICT Average Number Plants Per Acre	TEMERLOH DISTRICT Average Yield Per Acre Per Annum	TEMERLOH DISTRICT Gross Cash Value Per Kampong $	PEKAN DISTRICT Average Number Plants Per Acre	PEKAN DISTRICT Average Yield Per Acre Per Annum	PEKAN DISTRICT Gross Cash Value Per Kampong $	KUANTAN DISTRICT Average Number Plants Per Acre	KUANTAN DISTRICT Average Yield Per Acre Per Annum	KUANTAN DISTRICT Gross Cash Value Per Kampong $
Cocount ...	nuts	21.8	1024	25.62	16.0	1024	20.48	23.08	715	21.45	23.10	1155	8.00	35.20	2647	26.50	10.1	30	3.03
Mangosteen ...	fruits	1.0	450	1.32	1.9	665	1.66	1.46	156	.39	.59	413	1.38	1.50	750	1.35	.5	270	.27
Rambutan ...	"	4.0	2800	2.80	7.2	94	6.58	19.25	38,500	77.00	2.01	4020	4.02	1.20	4000	2.40	2.0	1100	2.20
Banana ...	bunches	9.5	9	1.08	30.0	30	3.00	75.16	73	7.30	13.02	13	1.36	24.60	24	2.40	—	—	—
Pomelo ...	fruits	1.0	60	3.00	.5	55	1.48	.87	17	.85	.29	15	.30	.25	21	.60	—	—	—
Pineapple ...	"	6.6	6	.12	11.4	11	.11	30.58	30	.60	4.00	4	.16	44.67	44	1.32	—	—	—
Durian ...	"	3.3	742	44.50	4.5	100	45.00	7.66	1530	76.50	1.26	277	27.70	1.15	126	7.56	10.0	125	62.50
Jack Fruit ...	"	3.5	28	5.00	1.6	10	3.20	4.75	24	4.50	2.21	38	5.70	2.20	22	2.42	.8	12	1.00
Langsat ..	gantangs	7.4	133	13.30	9.2	11	15.15	12.46	498	49.80	2.71	54	5.40	.50	7½	1.08	.5	20	1.50
Rambai ...	"	.7	21	1.05	.2	18	.32	1.25	87	4.35	.61	12	.06	.85	34	1.70	1.4	40	2.80
Bachang ...	fruits	1.3	150	1.50	1.6	250	4.00	1.25	297	.90	.63	139	1.39	.42	193	.60	.2	150	.17
Blimbing Buloh ...	gantangs	.9	6	.36	.1	8	.08	.41	300	.30	.31	1	.09	.12	½	.02	—	—	—
Jering ...	fruits	.7	287	.28	.1	500	.05	1.16	1740	1.74	.23	184	.18	.57	513	.37	—	—	—
Mata Kuching ...	gantangs	1.2	18	4.50	3.4	12	13.65	1.00	70	14.00	1.31	33	6.60	.20	5	1.00	—	—	—
Manggo ...	fruits	1.9	190	1.90	.1	130	.06	2.26	1380	13.80	1.41	570	2.85	1.22	73½	1.83	3.8	275	5.25
Total ...		6.48		106.36	87.8		114.82	180.60		273 78	53.42		66.09	114.65		51.15	29.3		78.79

Grading of produce is never undertaken and it is extremely doubtful whether, with the present marketing conditions, grading would result in any increased returns but, if any improvements are to be attained, some degree of grading will be found essential.

Organised co-operative sales—other than collective sales at roadside—have never been attempted.

The cash returns per acre appear high owing to the high yield figures given. Undoubtedly, a very useful additional income can be obtained from fruit holdings situated close to a ready market and this fact has undoubtedly been recognised by producers as is shown by the density of cultivation on such areas, when compared with other more isolated districts.

It has been stated that practically all Malay holdings include a certain amount of fruit cultivation, but there is one rather curious exception which occurs on the East Coast of Pahang. In most of the mukims south of Kuala Pahang the main source of income is derived from fishing and little if any attention is paid to agricultural undertakings, but the mukim of Endau, which is the most southerly of the coastal mukims, possesses fairly extensive areas of fruit cultivation, the surplus from which is disposed of in the mukims of Pontian, Rompin and Bebar where fruit cultivation is entirely lacking.

Little if any reliable information on the question of indebtedness of cultivators is available, individuals generally being disinclined to reveal such personal matters. The general impression formed is that indebtedness is not excessive.

Conclusions.

There is not scope, under existing conditions of population, for immediate large-scale expansion in fruit cultivation; as the country develops, however, gradual and continuous expansion should take place. At present, opportunities exist for small-scale expansion and particularly for the introduction of certain types of fruit at present sparsely cultivated and for which a ready market exists.

There exists a demand for good planting material of good types and every endeavour should be made to meet this demand for new plantings.

Cultural methods leave much to be desired, but there are indications of a very slight improvement as a result of past teaching and persuasion.

The marketing of small-holders' fruit, as of other produce, leaves much to be desired, but it appears that any general improvement can be obtained only by a Malayan campaign, as any attempt to improve conditions in any one District—or for that matter State—would come up against the interests of the middleman and retailer and would therefore be likely to suffer a boycott if supplies were available from other sources.

THE LAYOUT OF FIELD EXPERIMENTS

BY

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The results of field trials and their significance are frequently recorded in this Journal; the object of these notes is to explain why modern field trials are made along certain defined lines and what type of result is to be looked for.

A field trial has always the some object in view, namely, to ascertain whether one variety or strain of plant, or operation such as manuring, cultivation, drainage, spacing, method of sowing or pollination is better than another used under similar conditions.

For convenience in the following discussion the word "treatment" is used to cover any of these.

No field trial can give absolutely certain results. All that can be done is to arrange matters so that the *probabilities against* an increase or decrease shewn by one treatment over another being due to chance shall be great enough to amount to practical certainty under the particular conditions of the experiment. For general purposes it is considered sufficient that this chance should be, five in one hundred.

Simple Layouts.

The simplest possible form of trial is one in which some one treatment is compared with a control in a contiguous plot without repetition.

Let it be supposed that the treatment does in fact yield twice the crop of the control. This increase may be due to treatment but might as easily be due to differences in the original fertility of the two plots. There is nothing in the results to shew which is the cause of the difference. Some light would be thrown on the matter by repeating the experiment with the plots reversed, but as the new control plot had undergone a treatment previously, the issue would be confused. An alternative might appear to be to record yields in the first season and use these for controls for the next. The great objection to such a course is the unknown effect of the season on the plots. With differing conditions of temperature and rainfall, the results of the first season's observations might be confuted by the results obtained by a second season of such preliminary observation. In any case, by either of the methods considerable time is wasted.

Variation.

Let it be supposed that an experiment is concerned with a square piece of land 1 acre in area divided in one direction only (horizontally or vertically) into eight strips, the first four of which are control and the second four manured.

(i) If the fertility is phenomenally even and all the control strips give the same results as each other exactly, as do also the manured strips, then the results so obtained are merely those obtainable by dividing the area into two halves only. The effect of this is considered below, under "size of plot".

(ii) If the fertility is such that it increases from plot to plot as one passes from the extreme control plot to the extreme treated plot then undue bias will be given to the manurial results while in the converse case the effect of the manure will be partially masked.

(iii) If the fertility is not even, then the control and manurial results will vary amongst themselves and a further problem arises, how to estimate the value of the manurial effect compared with these phenomena of variation. A high result in a control strip, or a low result in a manured strip, will obviously affect the utility of the average. Further, differences in results may be due to pests and diseases, both of which have a similar effect to differences in fertility. The experiment, therefore, must be laid out in such a manner that these phenomena of variation may be allowed for in any subsequent mathematical examination of the utility of the average or mean.

Randomisation.

In (ii) above it was supposed that the fertility increased across the strips and although it lent a bias to the results it was nevertheless recognisable. If, however, the direction of fertility had been along the strips it would have passed unrecognised.

In laying out an experiment it is unlikely that it will be known in what direction this fertility drift will lie, but its presence will be observed if each strip is divided down its length into a number of plots, and these harvested separately, for then the fertility differences will become apparent no matter what is the general direction of the drift. An easier way appears to be to compare each treatment plot with the mean of the control on either side and this, in point of fact, has been advocated. The objection of such a method lies in the fact that if more than one treatment is considered the number of controls required is greatly increased.

The fertility variation is not likely to be graduated throughout the experimental area, but is likely to lie in patches; in cultivated soil as found in the farm lands of Europe, such patches are likely to be evenly distributed. On local soils which have not been subjected to centuries of cultivation—whether virgin jungle or carrying crops—the distribution is likely to be uneven.

To overcome this difficulty of patches of differing fertility, randomisation is resorted to, *i.e.* the treatment to be accorded to any given plot is chosen at random. Certain restrictions are frequently made, one of which is that if

RANDOMISED PLOTS

A	D	E	D	E
C	B	E	D	D
B	B	A	C	C
E	B	C	A	A
D	B	A	E	C

LATIN SQUARE

B	A	D	C	E
A	C	E	D	B
D	B	C	E	A
E	D	A	B	C
C	E	B	A	D

RANDOMISED BLOCKS

D	A	E	B	C
B	D	A	C	E
C	A	D	B	E
B	A	E	C	D
D	A	E	C	B

EXAMPLE OF COMPLEX EXPERIMENT CONFORMING TO THE LATIN SQUARE TYPE

A N PK NP NPK	D PK N NPK NP	B NPK NP N PK	C NP PK NPK N
D NP NPK PK N	C N PK NP NPK	A NP PK NPK N	B PK N NP NPK
C PK N NPK NP	B NPK NP N PK	D N NPK PK NP	A NPK NP N PK
B NPK NP PK N	A NP NPK PK N	C PK N NP NPK	D N NPK PK NP

possible, the number of control plots should be the same as the number of plots of any one treatment. This is not essential to the experiment, but is of great utility in simplifying the subsequent mathematical examination.

It frequently happens that the fertility patches (or gradients) are fairly large and while randomisation is necessary for the smallest units into which the experiment is to be divided, these large changes can often be dealt with, to some extent, by dividing the area into blocks in the expectation that differences in fertility will shew up in the differences of total yield for each block.

By dividing the area into blocks, fertility differences are eliminated in one direction only as will be seen from the accompanying diagram. Greater accuracy would be obtained if the blocks can be arranged in two directions. The best method of doing this is by the so-called Latin square arrangement in which the experimental area is divided into the same number of blocks in the horizontal and vertical direction as shewn in diagram. It need not necessarily be square in shape but it is essential that it shall be subdivided into the same number of plots in each direction. In order to distinguish the division into blocks in each direction, the horizonal division is spoken of as rows and the vertical division as columns. It so happens, in addition, that the total number of plots into which it is to be subdivided is usually the square of the number of treatments.

Within the block or within the column or row of the Latin square, the principle of randomisation will still hold, with the restriction that all treatments appear in each column and row or block the same number of times.

Analysis of Results.

Before proceeding to a discussion of such an analysis it is necessary to introduce the word "replicate", which is a term used to cover, in general phraseology, an undefined number of repetitions. If a treatment occurs three times then it is natural to speak of triplicates. Replicate cover all numbers.

How is the variation from plot to plot of the same treatment to be taken into account?

Since in Nature exact agreement of replicates can never be obtained, what is wanted is an estimate of the reliability of the means of the replicates of each treatment. As an example, suppose that the two following series are the results obtained.

$$1,\ 2,\ 1,\ 12 \qquad \text{mean} = 4$$
$$3,\ 4,\ 4,\ 5 \qquad \text{mean} = 4$$

The mean in each case is 4, but no one would hesitate in placing more reliance on the latter than on the former. A series of results in which differences from the mean are great should be made to carry less weight than a series where the individuals lie close to the mean.

This could be done, possibly, by summing differences from the mean, neglecting the + or — sign and dividing by the number of observations and calling it an error factor. For the above two series this would be

(*a*) $(3 + 2 + 3 + 8)/4 = 4.0$

(*b*) $(1 + 0 + 0 + 1)/4 = 0.5$

It is obviously possible to plot a curve, for any given series of results, of the values taken by the series against the number of times these values occur.

It can be shewn that, when the series can take any value (as against a discontinuous series), the frequency with which any value occurs will depend on the square of the difference of that value from the mean. Such a series is said to be normally distributed.

Consideration of the above two series will shew that such a curve can vary in its slope. What is wanted therefore is some non-graphical means of estimating this slope—or conversely, the extent to which values are scattered.

From the mathematical properties of this curve of normal distribution it can be shewn that the best estimate of scattering is given by the expression

$$\sqrt{\frac{\Sigma\ (m-x)^2}{n}}$$

This expression is called the standard deviation and is usually written as σ "m" is the mean, "x" is any observation and "n" is the number of observations. Examination of the form of σ shews that the less the observations differ from the mean (the steeper the curve) the smaller the standard deviation, for in order to estimate σ each observation in a series is taken from the mean in turn and the difference is squared. The squares so obtained are added together and divided by the number of observations; finally the square root is obtained.

Further, the standard deviation provides an estimate of the reliability to be placed on the results; it is a measure of the likelihood of any result differing from the mean by a given quantity. It is possible to find the odds against any deviation from the mean (for example say 10 per cent.) exceeding a certain quantity by chance. The usual standard adopted is twenty to one *i.e.* only five times in a hundred that such results shall be chance ones.

σ has been derived from the curve for normal distribution.

In the case of a small series of observations, it is found that a better estimate of the standard deviation is obtained by dividing by "n—1" instead of "n".

Taking the two series above the standard deviations would be

(a) $\sqrt{(3^2 + 2^2 + 3^2 + 8^2)/(4\text{-}1)}$ = **5.4 (approx.)**

(b) $$\sqrt{(1^2 + 0 + 0 + 1^2)/(4\text{-}1)} = 0.81 \text{ (approx.)}$$

The practical analysis of all experimental results in agriculture rests on the foregoing.

The researches of Fisher and others shewed that the variation in a field experiment could be divided into a number of parts and the residual variation could generally be reduced by eliminating variation due to known controllable factors. Field experiments may be grouped as follows :—

(*a*) Those in which there is complete randomisation of plots.
(*b*) Those in which plots are grouped into blocks.
(*c*) Those in which plots are grouped into a Latin square.
(*d*) Complex experiments in which two or more *types* of treatments are being studied simultaneously.

(*a*) If one treatment only were used in an experiment, no matter how many plots the land were divided into, it is obvious that all the variation which occurs would be due to differing fertility of the soil or individual plant differences. Such variation is spoken of as random or residual variation. If, however, there were two or more treatments, it is as evident that part of the variation is due to inherent differences between treatments. The residual variation, therefore will be the difference between the variation caused by treatments and the whole variation.

(*b*) In the case of experiments laid out in blocks, the total variation will be due not only to the causes outlined under (*a*) but also to the variation between one block and another, so that the residual variation will be the total variation less the variation due to treatment and the variation due to division into blocks.

(*c*) The same arguments apply to the Latin square, with the additional possibility of further reducing the residual or random variation by subtracting the variation due to columns.

(*d*) The complex experiment may conform to any of the above forms, but it is designed to answer more than one *type* of question at once *e.g.* the effect of cultivation and manuring.

In all the above cases it is desired to compare this residual or random variation with that due to treatments. In the case of the complex experiment this still holds good, but the variation due to treatments can itself be split up into separate parts due to each type of treatment and interaction between the types.

The usual estimate of the residual variation is called the random error and is in effect the Standard deviation of the residual variation.

Field experiments are not usually concerned with a single series, but are designed to answer the question of the reliability to be placed on differences of a number of treatments. The random error may be regarded as a measure of this. In order that one treatment may be considered significantly different

from another, it is necessary that the difference of their means should exceed the random error by an amount such that this excess could only occur by chance five times in one hundred trials.

For details of the working out of the random error by the elimination of variation due to blocks, treatments, etc. consultation should be made of the analysis of variance in R. A. Fisher's Statistical Methods for Research Students.

The Size of Plots and the Number of Replications.

A decision has always to be made, primarily, as to the size of the individual plots to be used and this will depend, to an extent, on the type of crop which is being studied, for with seasonal crops a large number of plants can be put in a comparatively small space compared with a permanent tree crop such as oil palm. Two factors are concerned, the larger degree of accuracy obtained from a larger plot owing to the fact that a larger number of plants approximate to the mean, a smaller degree of accuracy obtained owing to greater variations in soil the larger the plot. The most convenient way of determining this plot maximum in the first place is by preliminary observation of individual yields, in the case of crops such as oil palm, or of very small plots in the case of such annuals as rice.

From these observations an estimate may be made of the Standard deviation as defined above. Then from the same series of observations, by combining contiguous palms or plots, it may be determined up to what size of plot the standard error is continually and usefully reduced.

It is usually considered sufficient that the standard error should be below ten per cent.

It was pointed out above that in the Latin square type of experiment the number of replications is normally controlled by the number of treatments; in the case of a randomised block no such control exists but it will be realised that some determination must be made of the number of replications.

Still considering the standard error, it can be shewn that in a preliminary observational experiment with only two replicates, the standard error will be similar to the standard deviation and will be composed of the square root of the sum of squares of difference of the two replicates from their mean, divided by one.

If there were three replicates, the standard error would be the sum of the squares of the difference of three replicates from their mean, divided by two *et seq.*

Assuming that the differences from the mean are the same order in each case, the comparative figures for the standard error are shewn in tabular form below.

No. Plots	2	3	4	5	6	7	8	9	10
Comparative S.E.	1.00	0.85	0.82	0.79	0.77	0.765	0.757	0.750	0.746

From these figures it will be seen that whereas there is a drop of fourteen per cent. between two and three replications, there is only a drop of seven per cent. between three and five replications and a half per cent. between five and seven.

Hence there appears little to be gained by increasing the number of replicates beyond four or five.

(The process may be extended to cover more than one treatment).

The Effect of Seasons etc.

It should be quite clearly understood that the results of a given experiment only apply strictly to that experiment.

Different seasons might have a marked effect on a given experiment owing to the different reaction of different manures, varieties etc. to drought or excess rain or variations of light and heat.

If, therefore, very exact results are looked for, it will be necessary to repeat the same experiment over several seasons.

The seasonal means themselves can be submitted to a statistical analysis.

On the other hand, it must not be assumed that one season's trials are not very valuable. Difference of treatment may be so large as to leave little doubt of the significance in the case of annuals. In the case of permanent crops, in particular, it will be realised that even if the results for one season are highly positive, observations must be continued not only in order that the effect of differing amounts of rain, drought, light and heat may be studied, but also to obtain some idea as to the period of time over which a given treatment will be effective. Even such an observation as the latter may be repeated a number of times and these results of observations of the period of effective treatment can be analysed statistically.

Miscellaneous Articles

EXPORT MARKET FOR MALAYAN BANANAS.

The marketing of Malayan bananas in the United Kingdom is a trade that has been frequently suggested. It is as well therefore that those who contemplate development in this direction should be in possession of the facts. Readers of this journal who live in other tropical parts of the world, will appreciate exactly how far the conditions obtaining in Malaya are applicable to their particular circumstances.

The subject of banana export has recently invited renewed attention owing to the increased demand for the fruit in the United Kingdom. Shortage of supplies is the result of the recent hurricancs in the West Indies and of the incidence of Panama disease.

Incidence of Disease.

Panama disease, (*Fusarium cubense*), has been the cause of considerable anxiety in the West Indies since 1912, and it is estimated that in Jamaica, 15,000 acres have been lost to banana cultivation by infection, isolation under quarantine, or abandonment. Jamaica is combatting this disease by strict quarantine of infected areas and by raising immune varieties of bananas to replace the susceptible Gros Michel now generally grown throughout the Island.

Panama disease has been found in various parts of Malaya, but owing to the fact that there are several good commercial varieties which are not as yet affected with the disease, there is no immediate cause of alarm. Should, however, banana cultivation be extended for the purpose of export, it would be necessary to select a variety which is immune to Panana disease and which is acceptable on the market. The varieties which have proved to be most susceptible to the disease are Pisang Embun (the most important variety), Pisang Restali and to a less extent, Pisang Talon. Of those that are resistant or immune may be mentioned Pisang Mas and Pisang Serendah, the latter being one of the Cavendish forms. The wild varieties of the banana in Malaya (*Musa malaccensis* and *Musa violescens*) have not, up to the present time, been found attacked by the causal organism of Panana disease. If further investigation confirms this immunity, its usefulness in cross-pollination for the development of resistance in some of the desirable banana varieties which exist in the country suggests itself.

Transport Difficulties.

The second point to be considered is the distance of the market from the source of supply. It must be remembered that Malaya is a month's journey from England. The opinion of a prominent authority in London on this subject was sought. He states that he does not think that bananas would stand the journey. There are at present, two classes of boats running from Jamaica; one class brings the bananas in 12 to 13 days and the other in 16 to 17 days,

and the difference of the fruit is very marked. During the course of experiments with regard to another country, bananas were brought to England in good condition after a 28 days' voyage at 52—53°F. but they could not be made to ripen properly. Accordingly, if specially fitted ships were available to carry bananas from Malaya, the fruit would probably arrive in good condition, but would not ripen: they would just go soft and a dirty slate colour. Further, if there is any stem-rot or finger-rot in Malaya, the fruit would not arrive in good condition.

It would appear therefore, that although there is a potential market in the United Kingdom for bananas from Malaya, it is highly improbable that the fruit could be shipped to arrive in good condition.

Australian Market.

An alternative export market for Malayan bananas which has been suggested is Australia. We are indebted to H.M. Trade Commissioner, Singapore and H.M. Senior Trade Commisioner in Australia for the following information (we quote extensively from their memoranda on the subject).

The area under bananas in Australia in 1931 was 21,941 acres, whilst production therefrom was 2,728,982 bushels. Imports of fresh bananas in 1931/32 amounted to 28,721 centals (1 cental = 100 lbs.), approximately half of which were from Netherlands India.

The general tariff on imports is 8s. 4d. per cental to which has to be added surtax and primage duty. There is a preferential duty of 2s. 6d. per cental for imports of a quota of 40,000 centals of Fijian bananas. This rate does not apply to bananas imported from other British territories and any imports from Fiji in excess of the quota would be subject to the full rate of 8s. 4d. per 100 centals, together with further charges of 10 per cent. *ad valorem* primage duty, 2½ per cent. sales tax (from which local growers are exempt) and 4d. per case for inspection fees under quarantine regulations.

The preferential rate of 2s. 6d. accorded to Fijian bananas is found to be too high to permit of any profitable trade, despite the proximity of that territory to Australia, and there is little likelihood of the quota limit being reached as the trade has now virtually ceased.

From the failure of Fiji to attain their quota under the preferential tariff rate, it will be seen how improbable it is that more remote countries could develop any new trade under conditions of the full tariff rates and other charges.

The trade in bananas with Australia, hitherto carried on by Netherlands India, has been confined to Western Australia. This trade appears to have been governed by the fact that, until recently, production in Western Australia was not so large as in other States, and also by the possibility of landing fruit in saleable condition.

As the fruit ripens very quickly, every day in transit, exceeding five or six, is stated to involve an increasing percentage of loss, and with the rapid extension in production of locally-grown bananas under irrigation conditions,

growers in Western Australia are already under-selling and displacing the imported article, while it is anticipated that saturation point will be reached next year. In New South Wales and Queensland, a considerable increase in output is anticipated and warnings have been issued to growers against over-production.

With regard to the market for dried or preserved bananas, there is no trace of any past or present demand for these products. Dried bananas, under present tariff rates, would be subject to a duty of 6d. per lb., while that on preserved bananas is 3 s. per gallon British preferential and 4s. 3d. per gallon general rate.

Acknowledgments.

In the above article, extensive use has been made of a private communication received from Mr. J. G. Hibberd and also of a memorandum supplied to this Department by Mr. R. Boulter, C.M.G., H. M. Trade Commissioner, Singapore, who also forwarded to the Department a copy of a memorandum on the subject prepared by H. M. Senior Trade Commissioner in Australia. Use has also been made of Mr. F. A. Stockdale's Report on his visit to the West Indies in 1932.

The following authorities have also been consulted: Report of the Empire Marketing Board on Fruit Supplies in the United Kingdom (E.M.B. 65), Investigations on Panama Disease in Malaya by F. S. Ward (Special Bulletin, F.M.S. and S.S., Department of Agriculture, Scientific Series No. 2) and Banana Growing in Malaya and the Presence of Diseases by F. S. Ward (*Malayan Agricultural Journal,* Vol. XVIII No. 2, 1930).

ELEVENTH MALAYAN EXHIBITION.

The Eleventh Malayan Exhibition, organised by the Malayan Agri-Horticultural Association, was held at Kuala Lumpur for three days 2nd to 4th June 1934. Rain fell for short period on two days which had some effect on the "gate". The attendance was 22,588, as compared with 20,093 in 1933.

Considerable improvements were made in the layout of the Exhibition; in all section there was plenty of room for visitors to view the exhibits, while the absence of dust owing to improved flooring, added greatly to the general comfort.

The Opening Ceremony.

The Hon'ble Mr. M. B. Shelley, C.M.G., Chief Secretary to Government, in the presence of a distinguished gathering which included their Highnesses the Rulers of Selangor and Negri Sembilan, opened the Exhibition at 11 a.m. on 2nd June.

Before asking Mr. Shelley to open the Exhibition, Mr. F. W. Douglas, President, read a message of good wishes for the success of the Exhibition received from His Excellency The High Commissioner. Mr. Douglas briefly outlined the work of the Association during the past year and the main features of the present Exhibition.

Mr. Shelley reviewed recent developments affecting agriculture in Malaya. He hoped that the better position of the rubber industry caused by the new restriction agreement would not make us drift into that facile complacency with the condition of things which characterised the period preceding the depression.

Allusion was made to recent legislation concerning the Rubber Research Institute of Malaya and to the inauguration of a service of Asiatic rubber instructors who will work towards the improvement of the cultivation and produce of small rubber holdings.

In this connexion, Mr. Shelley suggested the re-introduction of competitions of small-holders' rubber at agricultural shows, which might be organised on lines similar to those of the All-Malayan Padi Competition.

Stress was laid on the value to Malaya of her other agricultural products. Of these, the vegetable oil industry and particularly with reference to coconuts, is experiencing considerable difficulties owing to the low prices for the produce. He hoped that the committee recently appointed by H. E. The Governor would find itself in a position to put forward recommendations which would help to alleviate the position.

The improved statistical position of the local rice industry was mentioned; the campaign to increase the area and quantity of rice grown in Malaya is now beginning to shew substantial results. It is anticipated that the acreage and yield returns of the present season will surpass the record set up last year. It is believed that the additional funds now available for improving present areas and developing new areas will materially assist in the further extension of the rice industry and bring Malaya perceptibly nearer self-sufficiency in the

matter of rice supplies.

The speaker drew attention to recent legislation designed to improve the pineapple canning industry of Malaya; to the padi competitions held throughout the country and to possible expansion of fruit growing.

In conclusion, Mr. Shelley stated that the work the Association is doing deserves encouragement and he therefore commended it for favourable consideration and support.

The Hon'ble Dr. H. A. Tempany, C.B.E., Director of Agriculture, thanked the Chief Secretary for having opened the Exhibition. In a short speech he stressed the importance of the coconut and oil palm industries and reminded his listeners that these two industries are passing through a period that is every bit as difficult as that which rubber experienced during the blackest days of the depression.

He considered that agricultural shows play an important part in any movement for the amelioration and improvement of agriculture. The fact that this Exhibition was larger than its predecessors indicated extending appreciation of the need for diversification of agricultural production. In endeavouring to improve the lot of the raiat, the extended planting of food crops, combined with the production of a diversified range of money crops, form the soundest policy.

Agriculture.

The agricultural section, which this year was adequately housed, was fully representative of the crops grown in Malaya. The total number of exhibits exceeded 4000. Competition in most of the classes was strong, the judges finding it necessary, in some cases, to make additions to the number of prizes offered. Perhaps the most outstanding classes—both for quality and number of exhibits—were those for copra and pineapples. The exhibits in the former class reflected the large amount of instructional and propaganda work towards the preparation of improved copra which during the past year or so has been undertaken by the Department of Agriculture. The exhibits of pineapples shewed how much alive is the Malaya canned pineapple industry and how excellent is the quality of fruit grown for this trade. The display of vegetables grown by school gardens is deserving of praise. The excellence of their exhibits indicates the very great improvement in the standard of school garden work in the past few years. In this section also was a special exhibit staged by the Cameron Highlands Society. It consisted of a wide range of fruits and vegetables grown on the Highlands. The produce was of excellent quality, the asparagus being especially good and provided a good demonstration of the possibilities of fruit and vegetable production for the local markets.

Other classes which were well represented were "gaplek" (sliced tapioca), tapioca flour, tea, coffee, kapok, arecanuts and bananas.

Apart from the display staged by the Cameron Highlands Society and the School of Agriculture, vegetables were below last year in numbers; the quality too was hardly as good.

All-Malayan Padi Competition.

This inovation proved one of the outstanding successes of the Exhibition. About 150 samples of padi, being prize-winning exhibits from fifty District shows held this year, were submitted. Each exhibit was accompanied by a certificate of origin, stating amongst other matters the area cultivated and the yield per acre obtained. As a full account of the organisation of this competition will be found in the next issue of this journal, further comment is unnecessary in the present account.

Poultry.

The poultry section was the largest in the history of these Exhibitions. A total of 582 exhibits were received, drawn from all parts of the country, consisting of 192 poultry, 161 pigeons, 152 eggs, 50 canaries and 27 cage birds.

The organiser of this section is to be congratulated on the most attractive layout of the section.

The most popular breed was the Light Sussex with Rhode Island Reds also in evidence. An encouraging feature was the fact that about 50 per cent. of the exhibits were pure bred birds, bred in Malaya; in fact the Gold Medal for the Best Bird in the Show was won by a Rhode Island Red locally bred.

The best cross-bred bird was Sussex x Rhode Island Red.

The native birds exhibited were stated to be very good--but the less said about the general quality of egg exhibits the better!

Pigs.

There were about 40 exhibits in the Pig Show, a slight increase on last year's entries. There was a considerable improvement in the standard of the exhibits. Most prizes were taken by Chinese pig "feeders" rather than "breeders", who in Selangor—from which State all exhibits were derived—make full use of the pure-bred stock at the Government Stock Farm for crossing with local breeds.

Of cross-bred exhibits the best were Berkshire x Chinese Sow, and Large Black x Poland-China.

Cattle.

This is the first occasion for some years that cattle have been included in the Exhibition. Owing to difficulties of transport and expense to the owners, Selangor provided all the entries. The Section was successful and it is hoped that the organisers will be able to extend it considerably next year.

Cats.

The Cat Show was as usual a feature of the last day of the Exhibition and attracted great interest. There were 44 entries, the largest on record. Pure bred Siamese cats form a prominent class at this annual show. In view of the excellence of this breed in Malaya and to its popularity in other countries it is surprising that the commercial aspect of Siamese cat breeding does not receive greater notice in this country.

Village Industries and Schools.

The importance of village industries in native agriculture is fully recognised by the organisers of this Exhibition, and every effort is made to popularise this Section. On the educational side one saw the exhibits from the Sultan Idris Training College for Teachers—an institution that has done much good work in bringing in the villages skilled instruction and the application of handicrafts for the production of many new and useful articles. The fact that exhibits made in Vernacular schools sell so readily at the Exhibition is proof that the educational side is working on the right lines.

In this Exhibition one not only saw—and could purchase—the articles made in schools, but there were numerous articles of all descriptions made by villagers in their own homes.

In some States, the Government organised the display and sale of the articles produced by the village industries of the State. In this connexion, mention must be made of the attractive displays from Kelantan, Trengganu, and Brunei.

It is understood that sales at the Exhibition were good—running into something like $4,000—a tangible result which should be a sufficient justification for the trouble and expense of the various organisations and Governments concerned.

Space forbids more than a passing reference to a very representative needlework section, the excellent school exhibits and to a section devoted to art and photography.

Horticulture.

The Horticultural Show was somewhat disappointing both in quantity and quality. By this statement no criticism of the organisers of this section is intended; the explanation probably is that owners of beautiful plants and flowers are afraid of damage which handling and transport may occasion.

The import of flowers into Malaya last year was valued at over $6,000, while in 1931 it was nearly $20,000. It is probable that with proper organisation, this country could entirely satisfy the present demand, while it is possible that the local demand could be increased. The Exhibition offered to cultivators at Malayan hill stations an opportunity for advertisement and for opening up new business of which they did not fully avail themselves.

Department of Agriculture, S.S. & F.M.S.

The Department staged a series of instructional exhibits in the permanent building which they share with the Rubber Research Institute of Malaya. The following account illustrates the scope of the display.

In view of recent work aimed at the improvement of native-produced copra, exhibits shewed the system of copra-grading, types of copra and models of improved copra kilns suitable for production of high grade copra from small-holdings. In addition, products manufactured from copra were shewn.

A comprehensive series of varieties of pure strain padi, produced by the Department and suitable to the varying conditions obtaining in Malaya was displayed—a collection which never fails to attract and interest Malay visitors.

Under fruit propagation, exhibits were designed to bring to notice budding and etiolation methods.

Another series of exhibits which proved of great interest were concerned with the production of the tea at Cameron Highlands. Chests of tea of different grades, information on London sales, valuation of grades and comparison with prices of tea produced in other countries, enabled the visitor to review at a glance the present position of the work of the Department in this direction.

A section of the display was concerned with poultry. Models of improved types of poultry houses were shewn, which incorporated the most recent recommendations of the Department and are especially designed to be of use in small holdings. Other exhibits in this section were drinking fountains, food troughs and trap nests. A series of wall illustrations shewed the proper methods of handling poultry and the desirable characteristics to look for in selecting and judging poultry and observing the condition of the birds.

Recent legislation in the Straits Settlements, Johore and the Federated Malay States in connexion with the introduction of measures designed to stabilise and improve the valuable canned pineapple trade in this country led the Department of Agriculture to stage exhibits illustrative of its investigations on this crop in the field, and to display samples with special reference to the proposed grading scheme. In addition, canned pineapples from countries which were actual or potential competitors with the Malayan product were shewn.

Samples of locally manufactured tobacco were staged, together with exhibits shewing different types of leaf and a model flue-curing barn.

Other exhibits were concerned with minor economic products—pepper, coffee, Brazil nut, Avocado pear, mushrooms, arecanuts and cloves. Exhibits of pigs and cattle from the Government Stock Farm were included in the above-mentioned Shows concerning such livestock.

A stall was also allotted to the display of milk from the Government Stock Farm, Serdang, with graphs illustrating its high degree of purity. Samples of fodder grasses and locally-produced feeding stuffs for cattle were also included in the exhibit.

The School of Agriculture, Malaya, occupied a stand in which were shewn the work of the School, the courses of instruction and the life of the students at the School, illustrated by a cinema film. Mention should also be made of the very fine exhibit of agricultural products grown by the students at the school, which was included in the Agricultural Show.

The Department had, in addition, a publication stand from which a range of its publications in English, Malay, and Chinese could be purchased.

Rubber Research Institute of Malaya.

The exhibits staged by the Rubber Research Institute illustrated the principal activities of the various Divisions at the present time, except that no exhibits were staged by the Soils Division.

Botanical Exhibits. The Botanical Division exhibits consisted mainly of a comprehensive series of large charts and diagrams illustrating the comparative yields of budded rubber, ordinary seedling rubber and seedling rubber derived from cross pollination of certain high-yielding clones.

These charts demonstrated clearly the marked superiority in respect of yield of budded rubber and seedling rubber trees derived from seeds of high-yielding clones over ordinary unselected seedling material. The records included high-yielding material derived from Java, Sumatra and Malaya.

A very striking series of enlarged micro-photographs of the latex-bearing tissue of high, low, and medium-yielding trees illustrated important differences in the anatomical structure of the tissue which it is hoped may prove of value in the selection of high-yielding material and also in showing the reasons for variation in yield.

Charts illustrating investigations which are now in progress on various systems of tapping were also displayed, while in addition, various modern tapping systems were also illustrated by means of models consisting of small trunks on which the tapping panels were marked out.

All the charts and diagrams were accompanied by printed narratives describing their essential features.

Pathological Exhibits. The exhibits of the Pathological Division were divided into two; *viz.* (*a*) Root Diseases of the Rubber and (*b*) *Oidium Heveae* Leaf Disease, which represent at the present time the two major activities of the Division.

Numerous specimens of the three principal root diseases—*Fomes lignosus* (White Root disease), *Ganoderma pseudoferreum* (Red Root disease) and *Fomes Noxious* (Brown Root disease) on actual rubber tree roots and also on jungle stumps from which the original infections are caused were staged. The whole exhibit was displayed with a view to illustrating the principal similarities of these root diseases. Printed narratives describing the origin of the diseases, their method of spread and treatment in young and old rubber areas were attached, so that visitors desiring information could readily obtain this from the narratives and the method of lay-out.

Considerable progress in the investigation of these diseases has been made recently at the Institute and the exhibits demonstrated the results obtained and illustrated the methods of treatment advised.

In relation to the leaf disease, caused by the Mildew fungus—*Oidium Heveae*—specimens of rubber tree leaves attacked by the fungus were shown, together with specimens under the microscope and enlarged micro-photographs.

Four of the dusting machines already used on estates in Malaya for treatment or control of the disease by sulphur dusting were displayed, together

with a series of samples of various commercial grades of sulphur powder which have been used for spraying or dusting. Photographs of the sulphur dusting machines in action were also displayed.

Chemical and Technological Exhibits. The exhibits of the Chemical and Technological Divisions may be divided into three, *viz.* (*a*) Latex Exhibits showing one of the principal defects, such as discolouration of the product due to contamination with iron.

In this section also were shown some of the principal non-rubber constituents of latex which have been isolated. (*b*) A complete factory lay-out for the preparation of either air-dried or smoked sheet. (*c*) A comprehensive series of rubber articles, manufactured direct from latex, including a few special articles such as rubber floorings and buckets made direct from raw rubber.

The latex exhibit illustrated recent important investigations carried out at the Institute on discolouration and stability of latex. Excellent specimens of air-dried sheet prepared by a special coagulant from ammoniated latex were also exhibited.

The model estate factory lay-out consisted of bulking and settling tanks, various types of coagulating tanks showing lay-out, a complete working model of a line-ahead sheeting battery (constructed by a local firm)—driven by means of a ½ H.P. electrical motor, and a model of a modern combined hot-air drying and smoke house including dripping and drying racks designed at the Institute and constructed by the same firm.

The essential features of this drying cum smoking house, consist of two chambers in each of which sheet rubber of not more than ⅛ inch thickness can be completely dried or dried and smoked in 48 hours.

A smoked sheet of good deep colour can be prepared by passing smoke for not more than 3 hours in toto into the drying chamber during the 48 hours, drying period.

A series of manufactured articles made direct from latex were included. These articles illustrated a few of the numerous recent applications of latex.

Co-operative Poultry Products Ltd.

The Co-operative Societies Department staged an exhibit of the apparatus used by this Union of Co-operative Egg-Collecting Societies for testing and grading the eggs which are being marketed in several towns of the Peninsula.

In this exhibit explanation and demonstration was given of the methods of candling eggs for freshness and of grading eggs for size and weight. The explanation was supplemented with diagrams and illuminated photographs.

The apparatus on show was similar to that used by the various Co-operative Societies affiliated to this marketing organisation. For nearly three years the Societies have been running efficiently and the apparatus is used by peasants with uniform and satisfactory results.

The Society operates from the Krian District of North Perak where the eggs are collected, candled, graded and packed. The Society has made arrange-

ments for sale of its eggs in Penang, Parit Buntar, Ipoh, Telok Anson and Kuala Lumpur.

Cinema.

As in past years, the staff of the Rural Lecture Caravan showed the propaganda films of the Agricultural, the Co-operative and the Health Departments.

An innovation was introduced this year. By means of a large ground glass screen, daylight shows were given both morning and afternoon at 11 a.m. and 4 p.m. respectively.

This screen was also used by officers of the Agricultural Department to give lectures on Poultry illustrated with lantern slides. The advantage of this arrangement is that the Lecturer can be seen by his audience and can himself see his audience whilst giving the lecture. Attendances at these daylight shows were rather poor because the public has not yet become accustomed to the times of daylight shows and it will be necessary to advertise more vigorously on future occasions.

The continuous evening film shows commencing at 7 p.m. were, as usual, very well attended.

Trade Section.

The Trade Section, which occupied almost the entire main permanent building, proved a great attraction. One is glad to note that although many exhibits were unrelated to agriculture, yet the great majority of firms in this country who trade in goods of an agriculture nature—such as machinery and fertilisers—were exhibitors on the present occasion.

Other Government Departments.

In addition to the Department of Agriculture, three other Government Departments staged exhibits. The Public Health Department has a permanent building of its own at the Exhibition, in which it staged a comprehensive series of instructional exhibits illustrative of the work of the Department.

The Posts and Telegraphs had on view the automatic exchange which will be installed at Ampang at the close of the Exhibition. The work of this exchange and that of a robot fault-finder was viewed by large crowds daily.

The F.M.S. Railway Department exhibited the latest type of second class carriage for day and night travel. The publicity provided should do much to popularise night railway travel by second class passengers, for at a very small extra charge they are provided with a well-appointed sleeping berth—complete with mosquito net!

This cursory record of the Exhibition would be incomplete without some word of appreciation of the Malayan Agri-Horticultural Association and of those ladies and gentlemen who assisted the Association in many ways to make the event a success. To these, to the Association and to individuals concerned with the constant entertainments, such as football, bicycle races, badminton tournament &c. we offer congratulations.

DISTRICT AGRICULTURAL SHOWS.

Lower Perak Agricultural Show.

The Lower Perak Branch of the Malayan Agri-Horticultural Association held an Agri-Horticultural Show at Teluk Anson on 28 April, 1934. In the absence of H.H. The Sultan of Perak the Show was opened by The Hon'ble The Raja Muda of Perak, C.M.G., M.F.C.

The Schedule contained 162 classes divided into 9 Sections.

Many exhibits were of a good standard, but also many fell short of exhibition standard—possibly on account of the fact that no show has been held for some years past.

One hundred and sixteen entries were received for the All-Malayan Padi Competition from which three samples were selected for competition at the State Padi Show and for subsequent despatch for competition at the Eleventh Malayan Exhibition.

The Village Industries Section was well supported and contained a large variety of articles of good workmanship.

The Department of Agriculture staged an exhibit of padi, copra and tea. The Drainage and Irrigation Department staged a model of the first section of the Sungei Manik Irrigation Scheme, an exhibit that attracted considerable attention. The Health Department staged a well-arranged exhibit and organised a Baby Show. The Sultan Idris Training College displayed a wide range of various articles, from attractive lamp shades to specimens of the soap manufactured by the College. The Teluk Anson Malay School also displayed good specimens of its pupils' work, including paintings and hand-work of various sorts.

Not only was the Show well supported in the matter of entries, but it was well attended throughout the day. The Hon'ble the British Resident attended the Show and distributed the prizes in the afternoon.

Bukit Mertajam Agricultural Show.

This show was organised by the District Economic Board, Province Wellesley under the Chairmanship of the District Officer, Province Wellesley.

Owing to the very large number of entries in the All-Malayan Padi Competition, preliminary judging was carried out in the small-holdings, any manifestly bad samples being rejected. Even so, upwards of 100 samples of padi were exhibited at the Show. The general quality was only average and did not compare well with the standard in Penang.

Agricultural and other produce was exhibited in 90 classes, arranged in 8 Sections. The general standard of the agricultural exhibits was very good and it is anticipated that if a similar show is held next year, the number of entries will be greatly increased, since great local interest was aroused by this event.

The Department of Agriculture displayed samples of padi with descriptive cards indicating the qualities to be aimed at for the purpose of the All-Malayan Padi Competition, mushroom cultivation and methods of rat destruction. The Health Department had an extensive series of exhibits devoted to rural hygiene.

About 2000 people attended the Show and local opinion is extremely favourable to the holding of a similar event next year.

Kelantan Agricultural Show.

The second Agricultural Show held in Kelantan took place on 19th May, 1934, at the Central Experimental Station, Kota Bharu.

The number of classes was increased from 30 last year to 41 on this occasion, these being divided into six Sections, one of which was devoted to exhibits from schools.

With the exception of "Miscellaneous" all Sections were well filled and the standard of the winning exhibit was most encouraging.

His Highness the Sultan visited the Show and was keenly interested in the various exhibits, particularly in the display of improvement in smallholders' rubber, fodder grasses, copra improvement, padi, and plant propagation methods staged by the Department of Agriculture.

The Malayan Agri-Horticultural Association kindly donated 6 medals and 6 diplomas. One of the five medals was awarded to the best exhibit in each Section and a certificate to the best exhibits from schools. A silver medal was awarded to the headman of the District which obtained the greatest number of awards.

Temerloh Agricultural Show.

A very successful show, at which His Highness the Sultan of Pahang was present, was held at Temerloh on May 19th. Both the number and quality of the exhibits were on the whole very satisfactory. The entries in the padi section were numerous, though many of the exhibits consisted of somewhat mixed strains owing to the fact that news of the local padi competition could not be made known until after growers had reaped their crops and mixed the padi in the storage bins.

Though many fruits were out of season, there was a good display of pineapples, especially of the Sarawak type, and of bananas. Other prominent classes were those for coconut oil and kapok, and several for different kinds of vegetables. In all these, there were numerous exhibits of which several were of noticeably good quality.

The physical drill competition for pupils from local vernacular schools, water and field sports, were run in connexion with the Show and all were attended by a very large gathering of Malays from all parts of the District.

Departmental.

FROM THE DISTRICTS.

May, 1934.

Compiled by the Chief Field Officer from Monthly Reports submitted by Field Officers.

The Weather.

The weather during May was, on the whole, hot and dry with a rainfall definitely below the average for the month. There were, however, showers which varied considerably in frequency and intensity in different parts of the country. As a consequence the rainfall in Kedah, Kelantan, Penang and Province Wellesley and northern Perak was only a little below or nearly up to average for the month. On Cameron Highlands there were two wet spells giving average rainfall. In the south, conditions were more irregular. In Malacca rainfall was above average, though the first half of the month was dry. In Johore, Batu Pahat District received twice its normal rainfall, while in other districts conditions varied from normal to very dry. A similar variation in rainfall distribution was experienced in Singapore Island.

Remarks on Crops.

Rubber.—With the official announcement that restriction would be brought into force on the 1st. June, prices rose quickly during the first ten days of the month and there was speculative buying in some districts. Later, when it became known that restriction would be effected gradually, the price declined substantially. The lowest and highest prices in dollars and cents per picul for rubber from small holdings were :—Smoked Sheet $16 to $34; Unsmoked Sheet $12 to $31.50; Scrap $2.50 to $16. Penang prices for Unsmoked Sheet ranged from $24 to $31.50 as compared with $20.50 to $24 in April.

General conditions on small holdings remained the same as in April, improvement in upkeep and in treatment of bark diseases being maintained. The possible effect of the appearance of a holding on the assessment of its production may have influenced owners towards improving the condition of their properties. On the other hand, severe tapping has naturally resulted from the desire to obtain as large a crop as possible at the present satisfactory prices, before the enforcement of export quotas puts an end to unrestrained production.

In Kelantan, the production of fairly clean and dry sheet rubber in preference to wet and dirty slab is making good progress, while the erection of small smoke houses by certain individuals is another step forward.

Padi.—The price of padi at the Government Rice Mill, Bagan Serai, remained at $1.40 per picul, while a private mill paid $1.30 per picul. The

price in Kedah improved somewhat and was equivalent to approximately $1.05 to $1.10 in Kota Star District, while in the Province the range was about 90 cents to $1.25 per picul.

The padi harvest was practically completed everywhere. Estimates made by the Department of Agriculture in Kedah showed that from an area of some 238,460 acres planted with wet padi an excellent crop of about 93,117,000 gantangs was reaped. This is a considerable increase both in planted area and total crop over the record figures for the previous season which in respect of wet padi were 219,010 acres and 74,366,000 gantangs.

In Kuantan District of Pahang, the yield per acre was estimated to be only 180 gantangs. This was probably due to inferior cultivation and lack of attention to weeding, since on the Sungei Blat Padi Test Plot the average yield per acre was nearly twice the figure for the District.

In Malacca, local distribution of selected padi seed has been completed and has amounted to 3,800 gantangs. The demand has been so heavy that part of it has had to remain unsatisfied owing to exhaustion of stocks. It is evident that the selected strains of the local Nachin and Siam padi are rapidly gaining in popularity among cultivators. An application has also been received from one district in Johore for seed of the same selected strains. It is hoped to supply this from Test Plots in other States.

Coconuts and Copra.—The average price of copra showed a slight improvement, ranging in different localities from $1 to $3 per picul. The Singapore price was about $2.40 as compared with $2.30 per picul in April.

In spite of the discouraging effect of the low price, the erection of kilns of the approved type for making copra of good quality continued in various parts of the country. In the Province one more such kiln commenced production, while in Krian three kilns were in operation and a fourth was under construction. In Kelantan a brick kiln was completed and produced copra of good quality. The new kiln built with the aid of Government at Sri Menanti in the Muar District of Johore was formally opened by the State Commissioner; the first copra produced reached a high standard. If the quality of commercial consignments is maintained at that of the first sample, the product is likely to command the top price in Singapore.

In eastern Pahang, one brick kiln has been completed, while in Pulau Tioman three kilns are in course of construction as a result of recent propaganda work in that island.

It is reported that copra in the Bagan Datoh District shows improvement generally. This is attributed in part to the effect of the propaganda work carried out during the visit of the Rural Lecture Caravan and in part to greater discrimination by certain local buyers.

The State Agricultural Officer, Selangor, reports that as a result of the construction of a bund by the Drainage and Irrigation Department to keep out sea water in the mukim of Bagan Nakhoda Omar, yields from coconut palms in that area have shown a marked increase and are now high.

Pineapples.—Heavy crops of fruit were obtained during the month in Selangor, Johore and Singapore Island. In Selangor the second factory commenced working again, in Johore eight factories were working, while in Singapore all the factories were working at high pressure. Prices for fresh fruits in Johore were:—first quality $1.20 to $1.50, second quality 90 cents to $1.20, third quality 60 to 90 cents per hundred. Corresponding prices in Singapore were $1.80 and 80 cents per hundred for first and second quality fruits. In Selangor prices ranged from 70 cents to $1.10 per hundred for large fruit, all fruits below a standard size being counted as half fruits only. From one area on the coast of Selangor fruits were being sold direct to Singapore at $1.80 per hundred.

Fruit.—Durians and mangosteens appeared on the markets in several parts of the conutry. Ripe fruits were obtained more especially in the Settlement of Penang, Larut District of Perak and Batu Pahat District of Johore, although in the latter the crops were poor. In fact, judging by the appearance of the trees, the general fruit crop throughout Johore will be very poor this season. Durians sold at weekly fairs in Krian from Larut District fetched from 5 to 12 cents each. A crop of mangoes and machangs was being harvested in Western Pahang and mangoes from Malacca were being exported to the market in Kuala Lumpur.

Coffee.—A heavy crop of coffee was being harvested in the Kuala Langat District of Selangor. Unfortunately Malays who prepare their own beans of reasonably good quality have been unable to find a market for their produce at reasonable prices and may be forced to revert to the practice of selling cherry to local middlemen for preparation. Coffee prepared by Malays in Kuala Selangor District is sold in various villages in the District and also at times in Klang and in Ulu Selangor District.

Local prices for coffee beans have ranged from $16 to $32 per picul in various parts of the country.

Tapioca.—Interest in the cultivation of this crop in Kedah has been well maintained and some 530 acres have recently been planted. In Malacca also a considerable increase in the planted area has resulted from the erection of a factory at Durian Tunggal. In Negri Sembilan 150 acres of tapioca have recently been planted and two factories, each with an output of about 700 piculs per mensem, are operating in Tampin District.

On the other hand, the area of tapioca interplanted with rubber in Segamat and Kluang Districts of Johore is decreasing rapidly as the rubber becomes mature, and factories are experiencing difficulty in obtaining sufficient supplies of root.

Tobacco.—Prices of sun-dried leaves have varied between $8 and $36 per picul in most parts of the country according to quality, but in Malacca the range was $28 to $50 and in Johore $30 to $70.

The high price in Johore is mainly due to the fact that all supplies of leaf are drawn from the Segamat District, growers elsewhere in the State having been discouraged by the damage occasioned fairly recently by floods or by the uncertainty of finding a market for their produce from previous crops. The result is now a considerable extension of the planted area in Segamat District.

In Kedah some 230 acres of tobacco have recently been planted, tobacco in Baling District being frequently grown as an intermediate crop on padi land. There is also a considerable area of tobacco in Perak.

Kapok.—Fairly considerable quanties of kapok were sold in local markets in Western Pahang at $12 to $14 for cleaned floss, a satisfactory price. There were some good exhibits of cleaned kapok at the Temerloh Agricultural Show. Prices in Eastern Pahang were 7 to 9 cents per kati for uncleaned kapok.

Agricultural Stations.

At the Central Station, Kota Bahru, Kelantan, poultry keeping was commenced with twelve Rhode Island Red Pullets obtained from the Pulau Gadong Station in Malacca, where there are now a fair number of young birds of various ages of both the Rhode Island Red and Light Sussex breeds. These have been produced locally from the stock imported from England last year.

Padi Stations and Test Plots.

Cultivation was commenced and nurseries were sown at the Pulau Gadong Station in Malacca. Work was in the same stage at five Padi Test Plots in other parts of the country, while transplanting was in progress on the two inland Test Plots in Selangor.

At the Sungei Blat Test Plot, Kuantan, Pahang, yields obtained were as follows:—Chendar, a local variety, 435 gantangs; Nachin 66, 320 gantangs; Siam 29, 303 gantangs; Siam 76, 302 gantangs; and Seraup 36, 296 gantangs per acre. These yields were approximately double the local average yield.

From the Telok Changai Station and local Padi Test Plots in Kedah fourteen pure strains were distributed for planting, eight being local selections and six being selections from Malacca and Krian. These are the strains approved for next year's Malayan Padi Competition and their distribution was accompanied by instruction work.

Rural Lecture Caravan.

The Caravan visited five centres in Province Wellesley from May 4th. to 13th. and six centres in Krian from May 14th. to 25th. The subjects dealt with were mainly poultry keeping and improved copra production. Both tours were quite successful.

Refresher Course for Malay Officers.

A Refresher Course for Malay Officers of this Department was held at the School of Agriculture, Malaya, and the Central Experiment Station, Serdang, from April 30th. to May 4th. Instruction was given on poultry, vegetative methods of reproduction, nursery work, and general work on tea and coffee. Certain officers spent one day at the Klang Coconut Station where demonstrations of the approved copra kiln and the method of making good copra were given.

DEPARTMENTAL NOTES.

Visits of Director of Agriculture.

The Director of Agriculture visited Klang, Bagan Datoh, Penang and Province Wellesley with the other members of the Vegetable Oils Committee, of which he is Chairman, on May 15 to 18 inclusive. Meetings of the Committee were held at each of the points mentioned.

Poultry Course.

The National Institute of Poultry Husbandry has arranged a Summer Course of Instruction of four weeks duration, for Colonial Officers on leave, at the Harper Adams Agricultural College, Newport, Shropshire, England.

Messrs. G. E. Mann, M.C., and F. R. Mason, both of this Department, will attend the course during their period of leave in England this year.

Visit to Java.

Mr. J. N. Milsum, Assistant Agriculturist, visited Java between 21 April and 7 May, 1934. The purpose of his tour was mainly to study the position in that country in relation to fruit cultivation, with special reference to methods of raising large quantities of stock for distribution.

He also took this opportunity of examining a number of crops, in particular the preparation of tea by Chinese methods.

Leave.

Mr. F. S. Banfield, Horticultural Assistant, has been granted 5 months and 4 days full-pay leave from 12 May 1934, before retirement on abolition of appointment.

Mr. F. R. Mason, Agricultural Field Officer, has been granted 7 months and 16 days full-pay leave from 16 May 1934 inclusive.

Mr. A. Thompson, Government Mycologist, has been granted 7 months and 8 days full-pay leave from 25 May 1934 inclusive.

Mr. J. Fairweather, Principal Agricultural Officer, Johore, returned from leave on 11 May 1934.

Statistical.

MARKET PRICES.

May, 1934.

Rubber.—The price of rubber reacted sharply to the official announcement on 30 April of an international rubber restriction agreement. The Singapore price for spot loose on that date was 21½ cents per lb.; thereafter the price continued to rise, until on 8 May it was 24¾ cents. The price then fell gradually and at the end of the month was 19¼ cents. The highest London and New York quotations during the month were 7¼ pence and 15 3/16 cents gold respectively. Average prices per lb. for the month were:—Singapore 21.35 cents, London 6.38 pence, New York 13.31 cents gold, as compared with 18.75 cents, 5.65 pence and 11.94 cents gold respectively in April.

Weekly prices during May for small-holders' rubber at three centres are shewn in Table II.

Palm Oil.—The course of the market is shewn in the following table. Basis 5 per cent. f.f.a.

Table I.

DATE	PALM OIL			KERNELS
	L'Pool/Holland/ Hamburg c. i. f. landed weights in bulk per ton £. s. d.	U.S.A. landed weight per lb. c. i. f. New York/ Philadelphia cents gold	L'Pool/Continent c. i. f. per ton net in barrels £. s. d.	Fair Average Malayan Quality c. i. f. Landed Weight per ton on Continent. £. s. d.
May 2	10 5 0	2.25	12 15 0	6 5 0
„ 9	10 10 0	2.25	12 15 0	6 10 0
„ 16	9 15 0	2.15	12 15 0	6 12 6
„ 23	9 15 0	—	12 10 0	6 12 6
„ 30	8 10 0	—	11 15 0	6 10 0

Copra.—The Singapore price of copra appreciated somewhat during the month, although there is no evidence of any real strengthening in the price. Sundried copra opened the month at $2.65 per picul, gradually improved to $2.90 by the middle of the month, at which price it remained till the end of the month. The average price per picul of this grade in May was $2.83 as

compared with $2.62 in April. The mixed quality averaged $2.35 per picul as compared with $2.15 in the previous month.

Copra cake was quoted throughout the month at $1 a picul.

Rice.—The average wholesale price of rice per picul during April was as follows:—Siam No. 2 (ordinary) $2.54, Rangoon No. 1 $2.42, Saigon No. 1 (long grain) $2.57, as compared with $2.82, $2.47, and $2.62 per picul respectively in March. Corresponding prices in April 1933 were:—$3.54, $2.95, and $3.22.

The average retail market prices in cents per gantang of No. 2 Siam rice in April were:—Singapore 23, Penang 25, Malacca 24, as compared with 23, 26, and 24 respectively in March.

Table II.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, May 1934.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.				Kuala Kangsar, Perak.			Batu Pahat Johore.				
	3.5.34	10.5.34	17.5.34	24.5.34	2.5.34	9.5.34	16.5.34	2.5.34	9.5.34	7.5.34	23.5.34	25.4.34
Smoked sheet	29.00	27.59	24.89	24.00				27.80	24.58	22.18	22.06	21.00
Unsmoked sheet	24.70	24.41	20.00	17.46						18.00		16.73
Rubber*					25.00	18.34	20.00	8.73	9.53	5.90	6.19	5.30
Scrap	8.06	8.21	6.14	—								

* Wet unsmoked sheet.

Transport by lorry Kuala Pilah to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases at Kuala Pilah on 31st. May or at Kuala Kangsar on 23rd. and 30th. May.

Tea.—Malayan (Lowland) tea was quoted in London in April at 1s.0¾d. per lb. Average London prices per lb. during April for tea consignments from other countries were as follows:—Ceylon 1s.2.98d., Java 1s.0.82d., Indian Northern 1s.2.07d., Indian Southern 1s.2.28d., Sumatra 1s.0.08d.

Tuba Root (Derris).—The Singapore market was essentially a sellers' market; in consequence prices shewed considerable marking up on the previous month's level. Rotenone-containing roots averaged $37 per picul, while roots sold on the ether-extract basis averaged $28.50 per picul, the advances being $4.50 and $2.50 per picul respectively during May.

Coffee.—The Singapore price of Sourabaya coffee remained steady; prices ranged according to grade from $20 to $21 per picul. Palembang coffee averaged $16.19 per picul, as compared with $17.19 in April.

Arecanuts.—Average prices per picul in Singapore were as follows:—Splits, $2.67 to $4; Sliced, $7.19 to $11.69; Red Whole $2.95 to $4.15; Sourabaya Whole, $3.62 to $5.50; Kelantan Whole, $3.47 to $3.71, the price within each range depending upon quality. There were no arrivals of Bila Whole. Average prices per picul quoted by the Singapore Chamber of Commerce were:—Best $4.16, Medium $3.56, Mixed $3.07.

Gambier. Singapore prices shew some improvement over those ruling at the end of April. Average prices per picul in May were, Block $4.25, Cube No. 1, $7.19 as compared with $3.81 and $6.75 respectively in April.

Pineapples.—Sellers were reserved in the earlier part of the month, but more business at slightly lower prices followed as the large crop being harvested came into the market. Singapore average prices per case in May were as follows:—Cubes $3.02, Sliced Flat $2.97, Sliced Tall $3.07 as compared with $3.02, $2.93 and $3.02 respectively in the previous month.

Tapioca.—Enquiry was good at the beginning of the month and prices advanced, but later the market became dull and featureless. Average prices per picul in Singapore during May were as follows:—Flake Fair $4.60, Pearl Seed $5.91, Pearl Medium $6.37, as compared with $4.19, $5.39 and $6 in April.

Sago.—The Singapore market exhibited features similar to that for tapioca. Average prices per picul in May were:—Pearl, Small Fair $4.76, Flour, Sarawak Fair $1.90; average prices in the previous month being $3.74 and $1.81 respectively.

Mace.—The Singapore market for mace and nutmegs was quiet throughout May. Quotations were steady, Siouw at $70 and Amboina at $50 per picul, as compared with $67.50 and $45 respectively in April.

Nutmegs.—On the Singapore market, 110's were quoted throughout May at $22.50, while 80's were $23 per picul. Corresponding average prices in April were $22.50 and $23.50.

Pepper.—The feature of the Singapore market was a sharp advance in price, said to be due largely to speculative manipulation in Europe. The price receded almost as sharply. The market closed with a steadier tone. Average

Singapore prices per picul in May were:—Singapore Black $16.19, Singapore White $34.75, Muntok White $35.75, as compared with $15.25, $29.62, and $30.12 respectively in April.

Cloves.—Singapore prices continue nominal at Zanzibar $35 and Amboina $45 per picul.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Mackey & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY.

April, 1934.

Malaya.—The foreign imports of rice in April amounted to 49,580 tons, exports for the month being 10,534 tons. Net imports were therefore 39,046 tons. The net imports for the first four months of 1934 were 148,309 tons, an increase of 17,626 tons, or 13.5 per cent. over the corresponding period of 1933.

Of the imports in April, 42 per cent. were consigned to Singapore, 23 per cent. to Penang, 6 per cent. to Malacca, 22 per cent. to the Federated Malay States and 7 per cent. to the Unfederated Malay States. Of the total, 52 per cent. came from Siam, 38 per cent. from Burma, 9 per cent. from French Indo-China and 1 per cent. from other countries.

Of the exports during April, 67 per cent. were shipped to Netherlands India and 33 per cent. to other countries. Of the various kinds of rice exported, 57 per cent. was Siam rice, 34 per cent. Burma rice, 4 per cent. Indo-China rice and 2 per cent. local production.

India and Burma.—Foreign exports in March amounted to 223,000 tons. For the first quarter 1934, the total exports were 698,000 tons as compared with 829,000 tons for the first three months of 1933.

Siam.—The exports of rice from Bangkok in April were 135,571 tons: total exports for the first four months of 1934 were 1,392,347 tons, as compared with 1,446,670 tons during the corresponding period of 1933.

Japan.—According to the Ministry for Agriculture and Forestry, (*Trans-Pacific Journal*, 12 April 1934) the stocks of rice in Japan proper on 1 March 1934 amounted to 7,582,600 tons.

The demand and supply of rice during the period 1 March, 1934 to 31 October, 1934, were estimated as follows:—

Supply:	Stock on 1.3.34	7,582,600 tons.
	Imports of Korean rice	666,200 ,,
	Imports of Formosan rice ...	375,900 ,,
	Imports of foreign rice	nil
Demand:	Eight months' consumption (Mar./Oct.)	6,336,600 tons.
	Export	43,500 ,,

shewing a surplus of 2,244,600 tons.

French Indo-China.—Entries of padi into Cholon, January to April amounted to 452,000 metric tons, as compared with 441,000 metric tons during the corresponding period of 1933, an increase of 2.5 per cent. Exports of rice January/April 1934, inclusive were 499,000 metric tons, compared with 502,000 metric tons for the period January/April 1933, a decrease of .6 per cent.

Netherlands India.—Latest available information published in the Summary for March 1934.

Ceylon.—The imports for the first four months of 1934 at 157,915 tons shew an increase of 19,896 tons, or 14.4 per cent. over imports for the corresponding period of 1933. Of 1934 imports, 16 per cent. were from British India, 66 per cent. from Burma and 18 per cent. from other countries.

Europe and America.—Shipments from the East to Europe from 1 January to 19 April, 1934, were 346,202 tons as compared with 458,268 tons for the corresponding period of 1933, a decrease of 24.5 per cent.

Of 1934 shipments, 38 per cent. were from Burma, nil from Japan, 43 per cent. from Saigon, 14 per cent. from Siam and 1 per cent. from Bengal, as compared with 44. 5, 42. 8 and 1 per cent. respectively in the corresponding period of 1933.

During the period 1 January to 26 March 1934, 12,325 tons were shipped from the East to the Levant, as compared with 9,457 tons for the same period in 1933; this is an increase of 30.3 per cent.

To the West Indies and America (1 January to 17 March, 1934) 30,200 tons were shipped from the East, as compared with 27,684 tons for the corresponding period of 1933, an increase in 1934 of 9.1 per cent.

MALAYAN AGRICULTURAL EXPORTS, APRIL, 1934.

PRODUCT.	Net Export in Tons.				
	Year 1933.	Jan.-Apl. 1933.	Jan.-Apl. 1934.	April 1933.	April 1934.
Arecanuts ...	20,756	7,949	12,547	2,443	2,798
Coconuts, fresh ...	100,609†	30,652†	31,485†	9,043†	9,833†
Coconut oil ...	17,568	6,312	8,331	1,676	2,080
Copra ...	110,543	29,160	33,329	8,258	5,830
Gambier, all kinds ...	2,560	749	693	156	134
Palm kernels ...	1,983	418	862	65	365
Palm oil ...	12,101	2,301	3,912	1,199	1,668
Pineapples canned ...	59,582	17,635	20,660	4,700	6,371
Rubber ...	459,836§	136,056§	163,901§	36,752§	39,484§
Sago,—flour ...	7,648	1,529	3,403	48	66*
„ —pearl ...	2,646	665	1,307	160	541
„ —raw ...	4,420*	1,373*	1,763*	295*	683*
Tapioca,—flake ...	9,881	4,135	2,972	1,080	800
„ —flour ...	702*	64	671*	28	139*
„ —pearl ...	17,297	5,600	5,246	2,135	1,471
Tuba root ...	569½	126	215½	46	65

† hundreds in number. * net imports. § production.

MALAYA RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING APRIL, 1934.

STATE OR TERRITORY	Acreage of Tappable Rubber end 1932 (d)	ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		ESTATES WHICH HAVE PARTLY CEASED TAPPING		AREA OF TAPPABLE RUBBER NEVER BEEN TAPPED		Total (3) + (5)	Percentage of (9) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STRAITS SETTLEMENTS :—									
Province Wellesley	44,734	1,106	2.5	8,697	19.4	1,048	2.3	9,803	21.9
Dindings	6,969	115	1.6	1,366	19.6	516	7.4	1,481	21.2
Malacca	111,780	4,724	4.2	20,142	18.0	4,794	4.3	24,866	22.2
Penang Island	1,635	653	39.9	216	13.2	177	10.8	869	53.1
Singapore Island	28,269	5,437	19.2	4,857	17.2	540	1.9	10,294	36.4
Total S.S. ...	193,387	12,035	6.2	35,278	18.2	7,075	3.6	47,313	24.4
FEDERATED MALAY STATES :—									
Perak	250,951	4,744	1.9	39,653	15.8	13,395	5.3	44,397	17.7
Selangor	308,379	5,596	1.8	48,603	15.8	14,160	4.6	54,199	17.6
Negri Sembilan	228,541	6,867	3.0	37,405	16.4	15,793	6.9	44,272	19.4
Pahang	38,141	2,492	6.5	12,071	31.6	6,012	15.8	14,563	38.1
Total F.M.S. ...	826,012	19,699	2.4	137,732	16.7	49,360	6.0	157,431	19.1
UNFEDERATED MALAY STATES :—									
Johore	325,747	15,453	4.7	31,069	9.5	22,232	6.8	46,522	14.2
Kedah (a) (b)	126,588	10,292	8.1	12,704	10.0	15,574	12.3	22,996	18.1
Kelantan	21,176	1,680	7.9	4,619	21.8	4,163	19.7	6,299	29.7
Trengganu (c)	4,643	Nil	Nil	1,609	34.7	200	4.3	1,609	34.7
Perlis (a) (b)	957	159	16.6	192	20.0	318	33.2	351	36.6
Total U.M.S. ...	479,111	27,584	5.8	50,193	10.5	42,487	8.9	77,777	16.2
TOTAL MALAYA ...	1,498,510	59,318	4.0	223,203	14.9	98,922	6.6	282,521	18.9

Notes :—(*a*) Registered companies only and are rendered quarterly.

(*b*) The figures quoted for Kedah and Perlis are those for end December 1933, and Kelantan end January, 1934 Revised figures will be published when available.

(*c*) Registered Companies only.

(*d*) Figures for end December 1933, are not yet available.

(*e*) **Estimated : figures not yet available.**

MALAYA RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF APRIL, 1934 IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
	Ports	Dealers	Estates of 100 acres and over	during the month	January to April inclusive 1934	during the month	January to April inclusive 1934	during the month: Foreign	during the month: From Malay States & Labuan	January to April inclusive 1934: Foreign	January to April inclusive 1934: From Malay States & Labuan	during the month: Foreign	during the month: Local	January to April inclusive 1934: Foreign	January to April inclusive 1934: Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States	...	16,339	9,813	10,613	45,348	9,794	42,286	Nil	Nil	Nil	Nil	14,066	9,479	62,427	27,584	...	14,254	8,742
Johore	...	3,404	3,054	3,759	14,524	5,420	19,329	Nil	3	Nil	16	1,796	7,271	6,570	27,213	...	3,694	2,879
Kedah	...	323	1,822	2,586	10,996	1,447	6,493	Nil	Nil	Nil	Nil	1,512	2,732	6,071	12,316	...	378	1,556
Perlis	...	14	14	8	51	38	147	Nil	Nil	Nil	Nil	Nil	27	Nil	194	...	27	20
Kelantan	...	809	124	224	889	430	3,408	Nil	Nil	319	Nil	109	925	369	4,112	...	389	164
Trengganu	...	55	50	246	865	123	431	Nil	Nil	Nil	Nil	Nil	369	Nil	1,296		55	50
Total Malay States	...	20,944	14,877	17,436	72,673	17,252	72,094	Nil	3	319	16	17,483	20,803	75,437	72,715	...	18,797	13,411
STRAITS SETTLEMENTS :-																		
Malacca	...	3,812	992	1,267	5,277			1		3		3,348		14,040		...	3,582	892
Province Wellesley	...	1,871	435	491	2,123			Nil		Nil						...	2,291	421
Dindings	...	74	133	94	420	2,759	10,582	Nil	16,554	Nil	66,597		Nil		Nil	...	77	103
Penang	1,090	6,928	6	7	44			2,036		8,125		8,726		34,080		1,777	7,002	4
Singapore	6,841	38,608	144	178	688			18,920		63,572		27,191		104,628		9,403	39,249	137
Total Straits Settlements	7,931	51,293	1,710	2,037	8,552	2,759	10,582	20,957	16,554	71,700	66,597	39,265	Nil	152,748	Nil	11,180	52,201	1,557
TOTAL MALAYA	7,931	72,237	16,587	19,473	81,225	20,011	82,676	20,957	16,557	72,019	66,613	56,748	20,803	228,185	72,715	11,180	0,998	14,968

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
20	21	22	23	24	25	26
DRY RUBBER	10,363	32,697	6,403	4,699	1,655	122
WET RUBBER	3,319	6,552	599	1,251	2,039	256
TOTAL ...	14,254	39,249	7,002	5,950	3,694	378

TABLE III
FOREIGN EXPORTS

PORTS	For month	January to April 1934
Singapore ...	37,741	147,278
Penang ...	12,951	53,242
Port Swettenham.	5,491	24,736
Malacca ...	565	2,929
MALAYA ...	56,748	228,185

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January to April 1934
Malay States ... / Straits Settlements	36,316	159,760
MALAYA ...	36,316	159,760

Notes :—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, *i. e.*, Column [9] = Columns [15] + [16] + [19] + [20] + [21] + [22] —[4]—[5]—[6]—[7]—[11]—[12]. For the Straits Settlements. Columns [9] and [10] represent purchases by dealers from local estates of less than 100 acres, reduced by 15 % to terms of dry rubber.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15 %, wet sheet, 25% scrap, lump, etc., 40 %; stocks elsewhere are in dry weights as reported by the dealers themselves.

4. Domestic exports are estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign exports of the later month.

5. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 26 May, 1934.

Locality	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total	Total	Most in a day Amt.	Number of days: Precipitation .01 in or more	Precipitation .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total	Daily Mean	Per cent
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.								
Railway Hill, Kuala Lumpur, Selangor ...	91.2	72.5	81.9	95	70	85	75	84.6	85.0	15.52	394.2	3.48	24	21	10	7		182.35	6.08	50
Bukit Jeram, Selangor ...	88.1	72.7	80.4	90	71	85	74	84.5	85.9	6.86	174.3	2.56	17	13	2	1	1	209.20	6.97	57
Sitiawan, Perak ...	89.0	72.9	80.9	91	71	78	75	84.1	84.7	3.32	84.3	1.37	20	10				209.25	6.97	57
Temerloh, Pahang ...	91.0	73.0	82.0	93	71	87	75	85.9	85.7	7.35	186.7	2.69	15	13				216.05	7.20	59
Kuala Lipis, Pahang ...	89.7	72.1	80.9	92	69	87	74	84.5	84.3	9.65	245.1	3.58	19	17	2	19		193.45	6.45	53
Kuala Pahang, Pahang ...	86.6	74.0	80.3	89	72	83	77	84.6	84.4	8.99	228.3	4.56	14	12	2			265.45	8.85	73
Mount Faber, Singapore ...	86.6	73.6	80.1	90	70	77	76	82.2	81.8	3.62	92.0	0.82	16	12	3			191.35	6.38	52
Butterworth, Province Wellesley ...	88.2	74.0	81.1	90	72	82	76	84.5	85.6	6.66	169.2	2.42	15	12	1			211.55	7.05	58
Bukit China, Malacca ...	85.4	73.9	79.7	91	72	83	76	83.7	83.7	4.31	109.5	2.69	12	8	1			200.85	6.69	56
Kluang, Johore ...	88.9	71.2	80.1	92	68	81	73	82.2	81.7	10.20	259.1	1.75	19	15	3	7	1	175.45	5.85	48
Bukit Lalang, Mersing, Johore	86.1	71.9	79.0	90	69	80	74	81.9	81.0	4.01	101.9	1.15	15	12		3		227.30	7.58	62
Alor Star, Kedah ...	90.2	73.1	81.7	94	68	85	76	86.1	85.5	8.40	213.4	2.20	18	16	17	5		231.95	7.73	63
Kota Bahru, Kelantan ...	89.1	72.6	80.9	92	65	84	75	83.9	83.6	4.41	112.0	2.50	10	7	2			277.00	9.23	76
Kuala Trengganu, Trengganu	88.1	72.2	80.1	91	68	85	75	84.0	83.9	3.27	83.1	0.93	7	6	2	4		278.30	9.28	76
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. Pahang ...	73.5	62.6	68.0	77	59	71	64	71.5	71.6	10.73	272.5	1.68	23	21	8	10		138.55	4.62	38
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	72.5	56.1	64.3	76	49	69	62	69.2	69.1	12.91	327.9	1.56	26	24	1			109.85	3.66	30
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	71.6	59.8	65.7	75	57	67	62			13.76	394.5	2.31	26	24	1			125.30	4.18	34

Compiled from Returns supplied by the Meteorological Branch, Malaya

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The Agricultural Economist.

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EDITORIAL.

Fruit Research in Java.

The recent visit of Mr. J. N. Milsum to Java to study fruit cultivation in that country, an account of which will be found in this number, again brings to the fore the subject of fruit cultivation in Malaya to which we drew attention in last month's number of this Journal. On that occasion, our comments dealt mainly with the economics of fruit-growing in Malaya. The present article in concerned more particularly with the technical aspect of the subject.

The Horticultural Bureau of the Department of Economic Affairs is responsible for the fruit work in Java and Sumatra. With three research experiment stations and twelve European officers it has been possible to initiate research work along several lines and results of great value are already emerging from this organisation. We are indebted to the Government of Netherlands India and particularly to the Head of the Agriculture and Fishery Service, Java, and to his officers, for providing facilities for Mr. Milsum to see the work in progress, and for permission to publish his report in this Journal.

The work of the Bureau of Horticulture is concerned not only with scientific research on fruit culture, including economic investigation of distribution and yields of the different kinds of fruit trees, but also with the supply of large quantities of good quality planting material.

Perhaps the most interesting aspect of this work is the method adopted for raising large quantities of good varieties of fruit for distribution. Technique in this respect has advanced considerably in recent years. In this connexion, it is noted that in many cases, the method now adopted of raising stocks of planting material results in early fruiting. Perhaps the greatest deterrent to fruit-growing in this country is the length of time which must elapse before any return on outlay may be expected. It is largely for this reason that fruit growing is confined to cultivation on a small scale. The production of good fruit in a shorter period should encourage cultivation on a larger scale.

In a comparison between fruit-growing in Malaya and Java one cannot avoid reference to climatic differences between the two countries. Java experiences more defined seasons than does Malaya, a factor of profound importance in fruit-growing. With our more equable climate, the choice of fruits which may be cultivated successfully is more limited than in Java. The difficulty

is not so much that the fruits cannot be grown successfully, but that flavour is affected. It is perhaps dangerous at this juncture to particularise, but at a venture, we suggest that Malaya will always prove less suitable than Java for citrus fruits and mangoes. On the other hand, there are a large number of fruits, such as rambutans, mangosteens and chikus, particularly suited to our climate, and while we would not suggest neglect of research work in Malaya on the citrus fruits, we do emphasise the prospects of early improvements by concentration on varieties of fruits well-suited to local conditions and on the wide distribution of improved stock throughout the country.

Agriculture in Labuan and Brunei.

The Director of Agriculture paid a visit to Labuan and Brunei in 1932 to advise the Governments concerned on the agricultural development of these territories. His report included a scheme for the establishment of agricultural services, designed in particular to effect improvement in the agriculture of the small-holder. An account of this visit, in so far as it concerned agriculture in Brunei, was published in the *Malayan Agricultural Journal* in November 1932.

The recommendations put forward as a result of that visit have been adopted by these two Governments, in so far as the financial position permitted, and an agricultural service has been inaugurated. At the present time the work is under the Agricultural Field Officer, Singapore, who makes periodical visits, but it is expected that in the near future, a senior agricultural officer will be resident in Brunei. The nucleus of an Asiatic staff has been appointed and is receiving training at the School of Agriculture, Malaya, and at other Stations of the Department of Agriculture in this country.

In the meantime, work has progressed towards the establishment of suitable agricultural stations in both Labuan and Brunei. Work is necessarily somewhat restricted in the absence of personnel, but as will be realised by the article on Agricultural Progress in Labuan and Brunei, which is published in this number, the foundation for future work is being well laid and will prove a great saving of time at a later date when the staff is available to develop the present projects.

Original Articles.

FRUIT CULTIVATION IN JAVA*

BY

J. N. Milsum,

Assistant Agriculturist.

Introductory.

Owing to differences in climate and soil, Java is well suited for the production of almost all tropical fruits. A large indigenous population, mainly composed of small landowners, has resulted in extensive areas of fruit being planted, and in many districts fruit cultivation is an important item of native agriculture.

It is not possible in this place to record in detail the investigations conducted by the Bureau of Horticulture of the Department of Agriculture and Fisheries, regarding native fruit production in Java. The results of a detailed enquiry, made in 1925-1926 in the surroundings of Batavia were published in *Landbouw*, 11, 1926—1927, p. 923. It is shown that in two districts, Meester Cornelis and Kebajoran, in the residency of Batavia, a total area of 23,520 acres was planted with fruit trees. Each inhabitant possessed half an acre of land containing fruit trees. Small areas of rice fields and arable land were owned in addition. The number of ponies and cattle in the two districts was considerable and averaged one animal to every two acres of land cultivated. The manure obtained from this stock is extensively used for manuring the fruit trees. The enquiry disclosed the fact that the average number of fruit trees per acre, in the two districts named, was 33, not counting banana plants and salak palms, *Salacca edulis.*

From an inspection made in part of these districts by the writer in April, 1934, it appeared that fruit cultivation had increased and is the main source of income of the inhabitants.

The soil is rather poor, but by its physical condition well suited to the cultivation of all fruit trees, excluding mangoes and bananas. Rubber is not planted. A system exists whereby almost every landowner undertakes to rear a heifer or young bull for dairymen living near the large towns, in return for the manure obtained. A small cash payment is, in some cases, made to the landowner when the animal is returned to its owner. Ponies and goats are also kept on many holdings. The animals are stalled in small bamboo shelters with atap roofs and fed almost solely with grass clippings, collected from adjacent open spaces. Working ponies receive a small daily ration of rice bran. The pen manure thus obtained is utilized in manuring the fruit trees in the various holdings. The advantage of consistent manuring, especially of pomeloes, appears to be fully realized, and large crops of fruit are obtained as a result of this practice.

*** The following article is written as the result of a visit to Java during the period 22nd. April to 5th. May, 1934. A week was spent at Ragoenan Experiment Station, when a close enquiry was made regarding experimental fruit cultivation with special reference to methods of propagation.**

Distribution of Fruit Cultivation.

Fruit trees are extensively grown in West Java, between Batavia and Buitenzorg. Those of special importance are pomelo, rambutan, and chiku. Mangoes are largely grown in East Java, where the marked dry monsoon suits the requirements of this important fruit. Centres of production are Madoera and Pasoeroean; also Cheribon and Indramajoe on the northern coast between West and Mid-Java. Oranges thrive best at high elevations and are extensively grown at Malang and Garoet. Mangosteens are produced in West Java and also at Jogjakarta. Bananas are grown on a large scale at Banjoewangi in East Java, and exported in some quantity to Australia.

The production and distribution of fruit in Java is dealt with in detail in *Mededeeling van de Afdeeling Landbouw*, No. 19, Vruchtenhandel en Cultuur in Nederlandsch-Indie. As an indication of the internal fruit trade in Java, it may be stated that the transport of fresh fruit on the State Railways in 1929 amounted to 70,000 metric tons valued at approximately seven million guilders. The export of fruit from Java to the outlying districts of the archipelago in 1930 amounted to 3,662 metric tons valued at 446,000 guilders. Outside the Dutch East Indies the principal port of destination is Singapore. In 1930, 1,697 metric tons of fruit valued at approximately 170,000 guilders were thus exported. Some 216,600 bunches of bananas were shipped from Banjoewangi to Western Australia. The cultivation, marketing and shipping of fruit is almost entirely in the hands of natives.

With regard to the return obtained by the growers, investigations disclosed some interesting facts. At Garoet, the citrus centre, in 1929, the average proceeds derived from the sale of fruit amounted to guilders 43.75 per compound per annum, representing approximately 21 per cent. of the total income. In the Batavia district, the most important fruit centre in Java, this figure amounted to 45 per cent. The mango-growing districts produced fruit valued at 5,330,000 guilders, whilst in the districts surrounding Batavia the proceeds arising from the cultivation of fruit trees were estimated at six million guilders.

The Annual Report of the Horticultural Division for the year 1932 shows that fruit production in Java is of great importance and, owing to the thickly populated towns, a large amount of internal transport by rail is necessary to meet the demand. Approximately 12,065 metric tons of fruit were carried by rail from Batavia to the different residencies, the majority being distributed in West Java. The quantity of oranges and mangoes from East Java transported by the State Railway amounted to 1,050 metric tons and 4,860 metric tons respectively. Persimmons and oranges from Garoet amounted to 919 metric tons and 604 metric tons. A total of 903 metric tons of mangosteens were railed from the surroundings of Jogjakarta. Shipment of fresh fruit to Singapore amounted to 1,140 metric tons, mainly from Soerabaja, Cheribon, Bali, and Batavia.

Work of the Horticultural Bureau of the Department of Economic Affairs.

The bureau is administered by the Head of the Agricultural and Fishery Service with a Horticultural Adviser and two technical assistants. These officers are stationed at headquarters in Batavia. Some twelve European officers are engaged on fruit work in Java and Sumatra. Three research experiment stations are controlled by the bureau; Ragoenan near Batavia; Bedali near Malang, and Pasoeroen, both in East Java. Ragoenan is the main experiment station and is dealt with in detail in this article. The experiment station known as Bedali, is situated 1,575 feet above sea-level and is concerned with the experimental cultivation, and propagation for distribution, of oranges, mandarins, and lemons. The average yearly rainfall is 74 inches. This station, comprising 22 acres, was opened in 1928 in order to encourage the cultivation of citrus in East Java.

Mangoes thrive exceedingly well on the plains in East Java and receive particular attention at an experiment station, (area 30 acres) known as Pohdjentrek, near Pasoeroean. This station, opened in 1919, is situated on the plains and has an average yearly rainfall of 52 inches. Trial plots and experiment stations number about thirty, and are distributed throughout the main fruit-growing districts of the country. Several are situated in the hills with the object of assisting settlers, including Europeans, in the production of hill fruits such as oranges, grape fruits, avocado pears, and persimmons.

The main lines of work undertaken by the Horticultural Bureau are as follows—

- (i) Research in fruit culture.
- (ii) Supply of good quality planting material.
- (iii) Supervision of local fruit distribution.
- (iv) Chemical examination of fruit varieties.
- (v) Bee-Keeping in relation to fruit cultivation.
- (vi) Recording native fruit crop yields.

Investigations concerning diseases and pests are conducted at the Institute for Plant Diseases, Buitenzorg.

Fruit Culture at Ragoenan Experiment Station, Pasar Minggoe.

This experiment station, opened in 1921, is situated some 12 miles south of Batavia. Three estates make up the station and comprise 500 acres, of which about 320 acres are under cultivation. The station is concerned solely with research in connexion with fruit cultivation, and since it is in the centre of a large fruit-growing district, is particularly well suited for the purpose.

Soil.—The soil at the station is similar to that in the Batavia district and thence to the foot of the mountains. It consists of an ancient andesite tuff laterite of very great depth. The surface soil is deep red in colour with an almost

complete absence of sand. Although described as a clay, the soil is very porous and crumbles readily when dry. It contains about 4 per cent. of organic matter and 0.1 per cent. of lime. A remarkable feature is the small amount of potassium present (0.005 per cent. soluble in 2 per cent. citric acid solution). Plant growth shews ready response to phosphates and nitrogenous manures when applied to this soil. During wet weather the soil is particularly sticky and difficult to work but it soon dries out. Artificial irrigation is necessary during the dry monsoon and a comprehensive system of irrigating channels has been installed.

CLIMATE.—The average rainfall at Pasar Minggoe is 90 inches per annum. The main precipitation is from November to April, known as the West Monsoon. During the East Monsoon, *i.e.* May to October, the rainfall is considerably less with some rather dry periods. Temperatures appear to be very similar to those obtaining in Malaya.

The Technique of Fruit Tree Propagation.

Ragoenan Experiment Station was selected originally as a suitable site to conduct investigations in fruit culture, since it is in the centre of the most important fruit-growing district in Java. Material of the major fruits has thus been collected without much difficulty. With regard to the indigenous fruits such as pomelo, rambutan, and duku, and others of less importance, the opportunity has been taken of attending all exhibitions and tracing the trees that have produced fruit of superior quality. Periodical inspections are made during the fruiting season in all small holdings, and trees of superior quality marked and numbered. Since all fruits are propagated asexually, it has been found possible to gather together a representative collection of the finest fruits occurring in Java. In the course of these trials many selected trees have been discarded, and so far as possible only those varieties of superior quality and practical value are retained and propagated for distribution. Exotic fruits, such as citrus, avocado pear and mango, have been imported. Considerable research has been necessary to ascertain suitable stocks for these importations, especially for the commercial varieties of citrus.

Nurseries for Raising Stocks.

The standard method at Ragoenan of propagating almost all tropical fruits is by budding, mainly on to seedling stocks. Since the future behaviour of the fruit tree depends to a great extent upon a well-grown stock, it is of paramount importance that this branch of nursery work be given proper attention. The question of suitable stocks for different fruits is dealt with under a subsequent heading. It is proposed to record here how stocks should be raised.

The site of the seed bed should be on good soil that is well drained and capable of producing strong seedlings. It should be situated as near as possible to a water supply as watering during dry weather is often necessary. At

Jack Fruit in Nursery
Young trees four months old from budding.

Rambutans in Nursery
Rambutan Seenjonja on Rambutan Seematjan stocks, three months after budding

BUDDED RAMBUTAN
Five Years from Planting.

ORANGE IN BEARING
Valencia Late Orange on Rough Lemon Stock, Nine years old.

Ragoenan Experiment Station, where dry weather is experienced during the East Monsoon, artificial irrigation is undertaken. On present information it is doubtful whether this is essential in Malaya, although probably advantageous. The beds should be 4 feet wide, of convenient length, with paths 18 inches to 2 feet between each bed. The size of the seedling beds at Ragoenan is 50 feet by 4 feet, and this size is taken as a standard throughout this report.

The cultural treatment will naturally depend upon the tilth and fertility of the soil. Assuming that the land has been under cultivation previously, the soil should be rested before use and planted with a suitable cover crop, e.g. *Calopogonium mucunoides.* When required for use the beds should be deeply trenched and the green matter dug into the soil. Well-rotted cattle manure is then placed on the land at the rate of about 1,000 lbs. per bed. This is incorporated into the soil by a second digging. The amount of cattle manure applied to the land each time it is required for raising seedling stocks appears extraordinarily heavy, but experience has proved that to obtain satisfactory results, this is necessary. A dressing of artificial fertilizers is then applied to the beds and raked in. The usual dressing is a mixture of basic slag (4 lbs. per bed) and sulphate of potash (2 lbs. per bed). The bed is then in a suitable condition for sowing the seeds.

A light high shade is considered an advantage and *Sesbania grandiflora*, a light-leaved leguminous tree, may be used for this purpose. A few trees per acre of nursery only should be planted, since it is necessary to prevent root competition with the fruit seedlings.

In seed-sowing the procedure adopted varies according to the kind of fruit stock it is desired to raise. Fruits, such as the rambutan, durian, jack fruit, guava, duku, and avocado pear, are sown in three rows one foot apart, the seeds being spaced one foot apart in the rows. A light shade of rough ataps* placed on a bamboo structure two feet above the soil, is necessary, since the shade assists the seedlings during the early stages of growth. Regular watering and weeding is essential after sowing, and at all times the soil should be kept stirred in order to provide a surface mulch. The attacks of injurious insects must be guarded against. When the seedlings are about six months old, the tap root is cut back several inches by means of a long knife inserted beneath the soil. This operation should be carried out during wet weather. When the seedlings reach the atap roof of the shelter, shade is gradually removed in order to harden the seedlings preparatory to budding. Under suitable conditions the seedlings are ready for budding one year after sowing. Should growth be slow during the seedling stage, one or more applications of a nitrogenous fertilizer *e.g.* sulphate of ammonia, at the rate of 1 lb. per bed, may be applied to the soil between the plants and raked in. The treatment of the seedling beds is outlined in tabular form below —

* Ataps: a roof of leaves.

Treatment of Seedling Stock Beds.

Area	Cattle manure	Artificial fertilizers.	Period of growth.
50 ft. x 4 ft.		4 lbs. basic slag.	
		2 „ sulphate of potash.	
(200 sq. ft).	1,000 lbs.	1 lb. sulphate of ammonia.	One year.
		(one or more applications).	

Citrus stocks require rather different treatment from that outlined above. As is generally known, citrus plants are very liable to insect attack, and to secure clean growth during the seedling stage the beds are enclosed in a covering of light cambric. This is a necessary precaution against the leaf miner, *Phyllocnistis citrella*. The seedlings are transplanted before being used for budding.

The seeds are sown with the pointed end downwards to secure straight taproots. The distance of planting is about 2½ inches apart either way. After sowing, the entire bed is covered with white cambric, placed over a bamboo structure two feet from ground-level.

Germination of most stocks takes place within 3 to 4 weeks. Under average condition, the citrus seedlings are fit to be transplanted when six months old. They are carefully lifted from a moist seed bed and the taproot cut back a few inches, and planted in similar beds in three rows, each seedling being spaced one foot apart. A cambric covering is used for a further month to encourage the seedlings to become established. Budding may be undertaken one year after sowing the seeds.

Several other factors require mention with regard to the two principal citrus stocks used in Java; namely, propagation from cuttings and selection of seedling stocks. Both the rough lemon and Japanese citron may readily be raised from cuttings and serve equally well for stocks as seedlings. Cuttings about one foot long of hardened wood are selected and planted deeply in prepared beds under cambric covering. The exposed cut surface is coated with a mixture of paraffin wax (92 per cent.) and carbolineum (8 per cent.) in order to guard against fungus attack. Cuttings so treated produce roots in 4 weeks and may be transplanted a month later. Budding may be undertaken when the cuttings are six months old, and these are ready for transplanting at least six months earlier than seedlings. In citrus the growth of the scion is considerably influenced by the stock. The seedlings of most stocks are partly of vegetative and partly of generative type. It is necessary to discard the latter, since only vegetative seedlings should be used for budding. Weak seedlings and those with deformed taproots should be rigorously excluded. This subject has been dealt with by Dr. H. T. Toxopeus, in *Landbouw* VII, No. 10. In practice,

it is found that only 30 per cent. of Japanese citron seedlings and 70 per cent. of rough lemon seedlings are suitable for use. Should the seedlings begin to form side branches at any time, the branches should be removed, as a single stem is required for budding.

It will be seen from the preceding remarks that the amount of work in connexion with raising budded fruit trees is considerable. The actual cost, including supervision, of producing budded trees at Ragoenan Experiment Station made it necessary to charge 35 and 75 guilder cents per plant, to Asiatic and European, respectively.

Budding.

The usual method of budding is a modification of the Forkert method. While seedlings and cuttings can be readily grafted by several different methods, these are not commonly practised, since budding is so much simpler, quicker, and more economical of budwood than is any method of grafting. Budding is generally performed during the rainy season when the bark is in an active state of growth. Most fruits, however, may be budded at Ragoenan throughout the year, suitable conditions being indicated when the bark will separate readily from the wood. Javanese labourers become very adept at budding, and a skilled workman will bud 400 stocks per day, provided that the budwood is supplied to him.

Budding by the modified Forkert method consists in making a transverse incision in the bark of the stock as far as the cambium, after which the bark over a length of 1½ inches and a width of ⅓ inch is pulled down, either as one piece or else in several small strips. Should the bark fail to peel properly or tear off in small pieces, this indicates that the cambium is inactive and in an unsuitable condition for budding. Success by this method is greatest just before new shoots are produced.

In the ordinary Forkert method, which was used formerly with very unsatisfactory results, the bark is not pulled down, but is cut loose. The modified Forkert method, has the advantage that, before commencing operations, it is possible to ascertain whether the stock is fit for budding. Further, accuracy is possible in removing the bark of the stock exactly to the cambium layer without cutting and removing any wood.

From the strips of bark torn loose, two thirds are cut off, and the ends trimmed. A shield-shaped bud with no wood adhering is then inserted and bound up with raffia. With the majority of fruits waxed tape is unnecessary.

The budwood obtained from selected trees, is usually cut into pieces about one foot long, each piece carrying a number of dormant buds. The budwood should be of good normal growth, well-rounded and sufficiently hardened to permit of handling. Generally, non-petioled budwood about one year old is used, but at times this is difficult to obtain. When leaves are present on the previous year's wood, suitable budwood may be obtained by removal of the leaves about three weeks before use. This is often necessary in the case of rambutans.

A knife of fine steel is employed and a hone kept at hand to enable the knife to be sharpened as often as necessary. A cloth is used to remove any moisture or soil adhering to the stem of the stock.

The distance of the bud from the ground is determined by the conditions under which the trees are to be used. Certain citrus stocks are liable to be affected by fungus disease should the bud union come in contact with surface water or damp soil. For this reason, where the budded trees are to be planted in moist situations, high budding is undertaken. With other fruits, less liable to collar disease than citrus, or where the land is drier, the bud may be within three inches from the ground.

About three weeks after budding, the raffia is removed and the scion commences to grow. The portion of the stock above the union is cut back to within four inches of the growing bud. Three months later the remaining portion of stock wood above the sprouted bud is carefully removed. After growth commences it is necessary to provide a bamboo stake, from two to three feet high, to each tree, and to tie the shoot to the stake from time to time with strong raffia or coarse string. This is of considerable importance, since it is during the early stages of growth that a strong single stem should be formed. When the shoot is about three feet high it is generally topped, thus commencing the formation of a framework for the tree. The majority of fruit trees are sufficiently advanced for transplanting within six months to one year from budding.

While the plants are in the nursery, regular attention is given to insect control by spraying with lead arsenate and soap and kerosine emulsion. Citrus trees are sprayed with Bordeaux mixture two months before transplanting as a preventative against Diplodia. Budded stocks of certain fruit trees such as the rambutan, durian and duku, are difficult to transplant from the nursery. When preparing such trees for despatch by rail it is necessary to establish them in large bamboo baskets. The young trees are gradually hardened by removing the lower portion of the taproot and side shoots whilst in the nursery beds. After the trees have been placed in bamboo baskets they are kept under shade for a month until fresh growth commences. Those successfully established are gradually moved into full light and are then ready for despatch. The chiku and duku are both difficult fruits to raise as budded plants, the former because its growth is slow and the latter owing to its dislike of root disturbance.

Treatment of Various Fruit Trees.

The results of ten years' experimental work with the vegetative propagation of a large number of fruit trees, obtained in the different experiment stations in Java, have been published in *Landbouw* VI, No. 10, p. 944. It is not possible to refer to these results in detail, but the summarized table below records briefly the experience gained at Ragoenan Experiment Station. Citrus requires further explantion, since the work undertaken with these important fruits is extensive. This is dealt with under a separate heading.

Results of Stock Experiments at Ragoenan Experiment Station.

The following abbreviations are used under the headings of Budwood, and Season of Budding —

n = non-petiolated budwood.
p = petiolated budwood.
n/p = either non-petiolated or petiolated budwood.
1 = one-year-old wood.
2 = two-year-old wood.
w = rainy season.
d = dry season.

SCION.	STOCK.	Age of stock months.	Budwood.	Season of Budding.	Successful buds. per cent.
Anacardiaceae					
Anacardium occidentale Cashew Nut.	*A. occidentale* Cashew Nut.	6	n 1	w	85
Mangifera indica Mango vars.	*M. indica* Mango seedlings	12	p 1	d	80-90
	M. foetida Bachang	12	p 1	d	70
	M. odorata Kohini	10	p 1	d	80-90
Spondias dulcis 'Kadongdong'	*Spondias dulcis* 'Kadongdong'	10	n 1	w	45
Annonaceae.					
Annona muricata. Soursop.	*Annona muricata* Soursop.	10-12	n 1	d. w.	100
Annona reticulata Bullock's Heart	*A. muricata* Soursop.	10-12	n 1	d. w.	95-100
Annona squamosa Custard Apple	*Annona squamosa* Custard Apple.	12	n 1	d. w.	95
Bombacaceae					
Durio zibethinus Durian.	*Durio zibethinus* Durian.	9	n 1	w d	90 40
Caricaceae.					
Carica Papaya Papaya	*Carica Papaya* Papaya.	5	n 1	d	90
Euphorbiaceae.					
Baccaurea Motleyana Rambai.	*Baccaurea Motleyana* Rambai.	14	n 1	w	50
	B. recemosa	14	n 1	w	50
Flacourtiaceae.					
Flacourtia indica Rokam.	*Flacourtia indica* Rokam.	22	n 1	w	80
	F. inermis Lovi-lovi	9	n 1	w	80
Flacourtia inermis Lovi-lovi.	*Flacourtia indica.* Rokam	22	n 1	w	90
	F. inermis Lovi-lovi	9	n 1	w	90

Scion.	Stock.	Age of stock months.	Budwood.	Season of Budding.	Successful buds. per cent.
Lauraceae.					
Persea americana Avocado Pear	*Persea americana* Avocado Pear.	9	n l	w	80
Meliaceae.					
Lansium domesticum Duku.	*L. domesticum* Duku.	48	n l	w	60
Sandoricum Koetjape Kechapi	*Sandoricum Koetjape* Kechapi	11	n l	d.w.	60
Moraceae.					
Artocarpus integra Jack Fruit.	*A. integra.* Jack Fruit.	10-12	n l	d.w.	50-95
	A. Champedan Champedak	10-12	n l	d.w.	50
	A. rigida, Tampunai	12	n l	d.w.	50
Artocarpus communis. 'Sukun'	*Artocarpus rigida* 'Tampunai'	12	n l	d.w.	50
Artocarpus Champedan 'Champedak'	*Artocarpus integra* Jack Fruit.	10-12	n l	d.w.	50
Myrtaceae.					
Eugenia aquea 'Jambu ayer'	*Eugenia javanica* Wax jambo.	12	n l	w.	70
	E. densiflora (wild species in Java)	11	n l	w.	85
Eugenia javanica Wax jambo	*Eugenia javanica* Wax jambo.	12	n l	w.	95
	E. densiflora	11	n l	w.	90
Eugenia Jambos 'Jambu ayer mawar'	*Eugenia javanica* Wax jambo.	12	n l	w.	90
	E. densiflora	11	n l	w.	90
Eugenia malaccensis 'Jambu bol'	*Eugenia malaccensis* 'Jambu bol'	12	n l	d.w.	95
Psidium Guajava Guava	*Psidium Guajava* Guava.	13	n l	d.w.	100
Oxalidaceae.					
Averrhoa Bilimbi 'Bilimbing buloh'	*Averrhoa Bilimbi* 'Bilimbing buloh'	9	n l	d.w.	100
Averrhoa Carambola. Carambola.	*Averrhoa Carambola* Carambola.	12	n l	w.	100
Rutaceae.					
Citrus aurantifolia Lime.	*Citrus nobilis* hybrid Japanese citron	12	n/l	d	90
	Citrus Limonia Rough Lemon.	12	n/l	d	90-95
Citrus sinensis Sweet Orange vars.	*Citrus nobilis* hyb. Japanese citron.	12	n/p l	d	95
	C. Limonia Rough lemon.	12	n/p l	d	95
	C. sinensis Local sweet orange.	12	n/p l	d	95

Scion.	Stock.	Age of stock months.	Budwood.	Season of Budding.	Successful buds. per cent.
Citrus Limonia Lemon varieties	*Citrus nobilis* hyb. Japanese citron.	12	n/1	d	90
	C. Limonia Rough lemon.	12	n/1	d	90
Citrus medica Citron.	*Citrus nobilis* hyb. Japanese citron.	12	n/1	d	80
Citrus maxima Pomelo	*Citrus nobilis* hyb. Japanese citron.	12	n/p 1	d	90-100
	C. Limonia Rough lemon.	12	n/p 1	d	90-100
	C. sinensis Local sweet orange.	12	n/p 1	d	90-100
	C. maxima. Pomelo vars.	12	n/p 1	d	90-100
	C. Aurantium Saramacca citron (sour orange).	12	n/p 1	d	90-100
Citrus nobilis var. Mandarin orange	*Citrus nobilis* hyb. Japanese citron.	12	n/p 1/2	d	90
	C. sinensis Local sweet orange.	12	n/p 1/2	d	80-96
Sapindaceae.					
Nephelium lappaceum Rambutan vars.	*Nephelium lappaceum* Rambutan.	12	n/1	w	90-100
Nephelium mutabile Pulasan vars.	*Nephelium mutabile* Pulasan.	12	n/1	w	90
Sapotaceae.					
Achras sapota Chiku varieties.	*Achras sapota* Chiku.	36	n/1	d/w	60

Certain fruits, such as mangosteen, duku, chiku and several of the Eugenias, have proved either not amenable to treatment as budded trees, or unsatisfactory on account of the time taken to mature. It would appear that, in such cases, etiolated shoots or marcotted plants might be planted with advantage. Investigations on these lines offer great possibilities, since it may be found possible to select and propagate suitable stocks for such fruit by vegetative reproduction.

Citrus Culture.

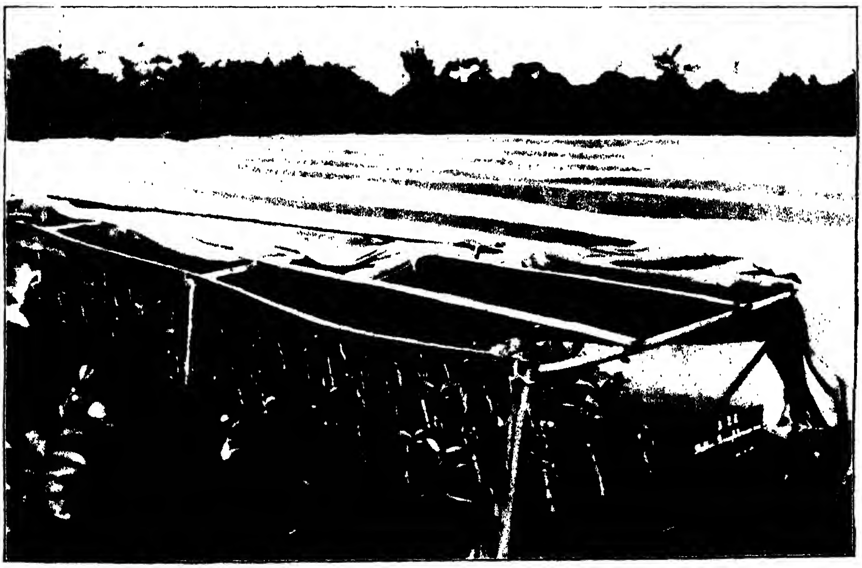
In the following tabulated list those citrus which have proved suitable in Java are recorded, with remarks regarding any special requirements:—

CITRUS.	VARIETIES.	REMARKS.
C. medica	Citron	Little economic importance.
C. Limonia	Pondorosa lemon	Thrives from 4000 feet downwards.
	Villafranca lemon	Used in manufacture of lime-squash.
C. aurantifolia	Lime	Generally cultivated.
	Tahiti lime	Grown on sour orange stock.
C. maxima	Pomelo	Most successful on the plains.
	Delima	European market.
	Balema	"
	Pandanlima	"
	Bali	Chinese market
	Seemanalagi	"
	Pandan wangi	Native market.
	Pandan bener	"
C. paradisi	Grape Fruit	Thrives from 5000 feet downwards with greater success on the hills.
	Duncan	Imported varieties.
	Marsh Seedless	
	MacCarty	
	Triumph	
	Manis besar	A local type that succeeds on the plains.
C. Aurantium	Sour orange	Resistent to disease but of little importance.
	Bigaradier	
	Saramacca citron	An imported rootstock.
C. sinensis	Sweet orange	From 3500 feet downwards. Greatest success is obtained on the hills with these imported varieties.
	Washington Naval	
	Valencia Late	
	Norris	
	Jaffna	
	Hamlin	
	Pineapple	An excellent fruit at Ragoenan.
	Manis	A local form. European market.
C. nobilis	Mandarin orange	From 3500 feet downwards.
	King orange	Successful on the plains.
	Siam	
	Satsuma	
	Tjeena Leetjin	Local form.

In addition to the stocks for citrus already enumerated, recent investigations have shown that the Saramacca citron, a sour orange, is suitable for pomeloes, grape fruit, and lemon. Experiments are in hand to obtain a satisfactory stock for imported grape fruit varieties. The following stocks are under trial—sour orange, Bigaradier orange, sweet lime, Japanese citron, rough lemon, sweet orange.

Pomelo in Bearing

Pomelo Delima on Japanese citron stock, seven years old.



Citrus Propagating Beds

Cuttings of Rough Lemon, five months old, as stocks. Showing cambric covered shelters.

Budded Grape Fruit Showing Frame
Manis besar on sweet lime stock.

Lemon in Bearing
Ponderosa Lemon on Sour Orange Stock, four years old.

Diseases and Pests.

Several diseases cause severe damage in the citrus orchards. Gum disease, *Phytophthora parasitica*, attacks the bark at ground level and may cause the death of the tree. Treatment consists of excising the diseased bark, after which the wound is smeared with a mixture of paraffin wax and carbolineum, in the proportion of 92 to 8. The sweet orange is particularly liable to this disease in Java. Recent investigations have proved that inarching seedlings of rough lemons or Japanese citron at the base of severely diseased trees saves many affected trees*. Diplodia gum disease, *Diplodia natalensis*, attacks the bark of the trunk and the main branches. The treatment is similar to that outlined above. Canker, *Pseudomonas Citri*, and scab, *Sphaceloma fawcettii*, attack the leaves, young growth, and fruits of most citrus and cause a corky excrescence. The infection takes place when the leaves and fruits are young. Both diseases may be effectively controlled by fortnightly spraying with Bordeaux mixture shortly before the young leaves appear and after the fruits have formed. A dry Diplodia (*Diplodia sp.*) attacks the smaller branches. It can be controlled in the early stages by spraying with Bordeaux mixture.

Insects pests are numerous. Mites, which damage the leaves and fruit, are kept in check by sulphur dusting. The larvae of a fruit fly and Citrus moth, *Citripestis sagatiferella*, frequently cause great damage to pomeloes and grape fruit. The only practical method to be employed in combatting these pests is to enclose individual fruits in paper or cambric bags, four weeks after setting. Several scale insects are troublesome and, unless attended to, may render the fruit unsaleable. Scales are kept in check by fortnightly spraying with kerosine and soap emulsion. Ants are responsible for the presence of certain scales, and the former are excluded from the trees by attaching a band of wire gauze covered with glue to the base of the tree. Mealy bugs and aphis are controlled by spraying with kerosine and soap, or 2 per cent. alcohol and soap emulsions.

Particular mention is made of the more important diseases and pests occurring at Ragoenan, since, without adequate control measures, the cultivation of citrus would undoubtedly be a complete failure.

Field Cultivation.

Planting is undertaken during the rainy season, when the soil is in a moist condition and the young fruit trees are not liable to receive any check. Most trees are planted with a stem about 2½ feet high. Citrus are usually cut back and four strong shoots allowed to grow. From planting to maturity constant attention to the growing trees is necessary. This is specially so in the case of citrus, which are very liable to serious disease and insect attack at all stages of growth. The land may be under leguminous crops or grass, but a wide circle round each tree should be cultivated and kept free from weeds. At Ragoenan Experiment Station, artificial irrigation is provided throughout all planted areas wherever practicable. It is not possible, without further experience, to say

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* Root Renewal of Citrus Trees with Gum Disease, *Landbouw*, VII, No. 5, p. 372.

whether irrigation is necessary under conditions in Malaya. Pruning is an important consideration, especially during the early stages of growth. The main object is to provide a suitable frame of strong main and lateral branches. Citrus trees, which are cut back severely before planting, tend to form a good head naturally. Certain fruit trees, such as the rambutan and pulasan, may be induced to form new growth for the next season's crop, by light pruning of the outer branches after the crop has been harvested.

Manuring.

Under the conditions obtaining at Ragoenan Experiment Station, heavy manuring is found necessary to secure adequate growth and yields from all varieties of fruit trees cultivated. Three large-scale field experiments are in hand. An area of 14 acres with Rambutan Seematjan on Seematjan stocks, planted in December, 1930, provides 504 trees under fourteen separate manurial treatments, including control plots. There are six trees in each plot with six replications randomised throughout the area. The trees commenced to flower in September, 1933, and the first crop of fruit was gathered in January, 1934. The trees in the plots receiving cattle manure or cattle manure together with artificial fertilizers, were more advanced and yielded a heavier crop than trees receiving artificial fertilizers alone, or in conjunction with legume and/or lime incorporated in the soil. A similar manurial experiment was commenced with an area containing 618 pomelo trees planted in 1932, and grape fruit trees planted in October, 1933. Cattle manure is dug into shallow trenches on the outer perimeter of the trees, whilst artificial fertilizers are spread beneath the trees and lightly covered with soil. The following treatment is commonly practised with young fruit trees at Ragoenan and serves as a guide to the manurial programme considered necessary.

Manuring of Young Fruit Trees.

Year.	Treatment per tree.	Remarks.
1	50 lbs. cattle manure	At planting.
2	100 lbs. " "	
3	150 lbs. " "	
4	2 lbs. sulphate of ammonia 4 lbs. basic slag 2 lbs. sulphate of potash	Trees in bearing.
5	-do- -do-	
6	-do- -do-	plus 100 lbs. cattle manure.
7	As 4th. year.	

Future treatment depends upon the appearance of the trees. Citrus trees in full bearing require heavy manuring with additional quantities of potash.

Yields.

The majority of budded fruit trees commence to bear during the third or fourth year from planting. The durian, duku and Jack fruit, bear fruit when about six years old. As already stated, the staff of the Bureau of Horticulture collects data annually regarding yields from the major fruits cultivated in a number of districts throughout Java. In the following table the average yields of fruit per tree, from fifty trees of different ages in Pasar Minggoe district for a varying number of years are recorded. The average maximum yield for the same period is given for comparison. Present prices, which the growers receive, are appended —

Yield of Fruit in Kampongs at Pasar Minggoe.

Fruit.		Average yield per tree.	Average maximum yield per tree.	Number of years.	Prices 1934 Guilder cents.
Mango local	...	482	2,600	3	1
Soursop	...	27	96	3	3-4
Bullock's Heart	...	78	413	3	—
Durian	...	72	252	5	5
Duku	...	782	5,220	5	—
Jack Fruit	...	10	71	5	50
Chempedak	...	62	331	5	15
Rose Apple	...	353	2,057	4	1
Guava	...	359	2,902	3	25 cts. per 100
Bilimbing	...	262	1,038	4	60 ,, ,,
Lime	...	385	2,000	4	10 ,, ,,
Lemon	...	90	500	4	50 ,, ,,
Pomelo :					
Pandanwangi	...	203	678	8	4
Delima	...	154	478	8	6
Mandarin Orange	...	667	3,423	4	25 cts. p. 100
Rambutan : Seematjan	...	126(x)	474(x)	9	G.2. 25 per 100 bunches.
Lebakboeloes	...	156(x)	549(x)	9	,,
Manis	...	127(o)	471(o)	9	,,
Chiku	...	1,373	4,392	7	6 cts. p. 100

(x) In bunches of 15 fruits.
(o) In bunches of 25 fruits.

The prices which growers receive are now at a very low level.

Records of yields of various fruit trees at Ragoenan Experiment Station, collected during 1933—34 are as follows:—

Yields of Fruit at Ragoenan.

Fruit.	Average fruits per tree.	Remarks.
Sweet Orange:		
Norris	334	7 year old budded trees.
Manis	349	-do-
Valencia Late	166	5 year old trees on rough lemon stock.
"	262	8 year old trees on rough lemon stock.
Sweet Orange:		
Manis	264	6 year old trees on rough lemon stock.
"	180	6 -do- -do-
"	436	6 year old trees on own rootstock.
Mandarin Orange:		
Satsuma	160	6 year old trees.
Siam	146	4 year old trees on Japanese citron stock.
"	150	4 year old trees on rough lemon stock.
King	147	On Japanese citron stock.
Pumelo Bali	128	7 year old trees on sweet orange stock.
"	141	7 year old trees on rough lemon stock.
"	128	7 year old trees on Japanese citron stock.
"	108	5 year old trees on sour orange stock.
"	170	7 year old trees on pumelo stock.
Rambutan:		
Seematjan	2,400	8 year old budded trees.
Lebakboeloes	1,460	6 year old budded trees.

Acknowledgments.

The writer is grateful to the Head of the Agriculture and Fishery Service, Java, for kind permission to visit the Ragoenan Experiment Station. Mr. J. J. Ochse, Chief of the Bureau of Horticulture, Batavia, and Mr. M. M. Magielse, Manager of the Experiment Station, Pasar Minggoe, afforded every facility in conducting the investigations and spared no pains in giving all necessary information. The writer desires to record his sincere thanks to these two officers.

NOTE ON THE VALUATION OF SOME NATURAL PHOSPHATES

BY

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A series of experiments with some naturally-occurring phosphates has been carried out recently in which attempts have been made to correlate the phosphate contents of the materials, as determined by their solubilities in various reagents, with the results of pot experiments, using maize as the indicator crop.

The phosphates used in the experiments comprised two samples of Perlis phosphate*, one sample of Gafsa rock phosphate and one sample of Cheribon rock phosphate.

As regards the analytical work, determinations were made of (*a*) degree of fineness of grinding using a 100-mesh sieve, (*b*) total amount of phosphate, (*c*) amount of phosphate soluble in 1 per cent. citric acid and (*d*) amount of phosphate soluble in 6 per cent. acetic acid. Acetic acid was employed to eliminate possible solution of iron and aluminum phosphate.

The methods employed for the determinations of the total and the citric acid soluble phosphates followed those laid down in the Official Methods of Analysis prescribed by the British Fertilisers and Feeding Stuffs Act. In the case of acetic acid, treatment consisted in boiling one gramme of the material with 100 c.c. of 6 per cent. acetic acid for one hour under a reflux condenser. The liquid was filtered and the phosphoric acid in the filtrate determined by the appropriate method.

Table I.

Details of Fineness of Grinding and Phosphate Contents with Various Reagents.

Details of Fertiliser.	Proportion of Material passing 100-mesh sieve.	Total Phosphate. as P_2O_5	Citric Acid Soluble Phosphate. as P_2O_5	Acetic Acid Soluble Phosphate. as P_2O_5
	per cent.	per cent.	per cent.	per cent.
Perlis No. 1 ...	68	6.9	1.3	1.5
Perlis No. 2 ...	82	20.6	16.5	8.0
Gafsa Phosphate ...	94	29.3	12.5	5.4
Cheribon Phosphate ...	76	29.6	12.9	6.0

* These local phosphates are usually known as guanos. They contain, however, negligible quantities of nitrogen.

The results of analysis are shown in Table I. In order to make the results comparable, all the figures have been calculated on a moisture-free basis.

The results of analysis indicate that, although the second sample of Perlis phosphate has a lower phosphate content than either the Gafsa or the Cheribon material, a higher proportion is soluble both in citric acid and acetic acid.

In the pot trials, the quantity of phosphate was adjusted so that the total amount present was equivalent to 30 lbs. of total P_2O_5 per acre. In order that the plants should not suffer from deficiency of nitrogen or potash, calcium cyanamide was added at the rate of 168 lbs. per acre and potassium sulphate at the rate of 56 lbs. per acre.

The differences in growth were striking and were obviously not in accordance with the total amounts of P_2O_5 present as will be seen from the accompanying photographs (See Plate I).

With such a trial, it is not possible to say whether growth was more in accord with the citric soluble or the acetic soluble phosphate. In the case of the citric soluble portion, Perlis No. 2 has more than 12 times the amount of Perlis No. 1, while the ratio is about 5 : 6 in the case of the acetic acid soluble phosphate.

Two broad conclusions can, however, be drawn :—

(i) It is useless to buy local guanos without some knowledge of the phosphate content.

(ii) The total phosphate is not a criterion of the value of such fertilisers.

Intending purchasers are, therefore, advised in all cases to obtain an approximate analysis of the material giving quantity of phosphate soluble in dilute acid.

Further, in view of the wide variation in composition shown by the two samples of Perlis phosphate, care should be taken to ensure that the sample submitted for analysis is representative of the consignment. This is especially necessary when the fertiliser is to be applied to quick-growing annual crops.

AGRICULTURAL PROGRESS IN LABUAN AND BRUNEI*

BY

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Part I - Brunei.

A visit to Brunei was timed to coincide with the padi harvest, but the season being somewhat earlier than usual, harvesting had finished in most districts by the middle of March. The main objects of this visit were the inspection and further development of work in progress at the Brunei Agricultural Station at Kilanas, the supervision of the harvesting of the padi experiments laid down last August, and furtherance of the general programme of agricultural expansion within the State.

Progress at the Agricultural Station, Kilanas.

Substantial progress with the establishment of this main Station has been made in the past seven months. As is inevitable in the opening of land in a district which, with the exception of one area under wet padi cultivation, is almost entirely under jungle, and which is very thinly populated, pests such as wild pigs, rats, birds, and insects have proved extremely troublesome. Early action was taken, however, to combat these pests and the appearance of the crops indicates the effectiveness of the necessary prevention and control measures taken.

The soil at this Station consists of sedimentary deposits of great thickness, is of a heavy clay nature and difficult to drain or cultivate. It is however, typical of Brunei.

A series of open drains has been dug, but these have not proved adequate and a revised layout has therefore been prepared. An experiment on liming the soil has been initiated.

A large number of different plants have been established at the Station, including well-known fruits, cover and forage crops, and miscellaneous crops of economic importance, most of which are being grown with the object of investigating the growth of crops suitable for cultivation by small-holders under local conditions.

Padi Experiments.

The first series of padi experiments was designed to compare the yields of pure strains of padi from Krian with the locally-grown varieties, and to observe the suitability of the former under local conditions. Insect pests proved troublesome and have affected the results. Although the results from this initial season are inconclusive, Seraup 15 and Siam 76 of the imported

* The following is abridged from Reports submitted by the writer on his visit to Labuan and Brunei between 2nd March and 3rd April, 1934.

strains, seem most suited, yields per acre being 383 and 324 gantangs per acre respectively, while a local variety, Sibakit, gave the third highest yield of 323 gantangs per acre.

Padi Test Plots have been opened at Kilanas and Lumapas where a number of local strains of padi have been planted for a preliminary study of type and yield with a view to selection work. From the crop obtained, selections were made for planting at a Station in Malaya.

Great interest is evinced amongst native cultivators in the work in hand. The Kilanas Station has now become a general meeting place for Kedayan cultivators, where matters relating to agriculture in general and padi planting in particular are discussed. Moreover, the area surrounding the Station is being opened up for more wet padi cultivation. A considerable extension of this area is anticipated in the coming season.

It is also reported that a demand for fruit tree planting material is beginning to arise in the Kilanas neighbourhood and that intending cultivators look to the Station as the natural source of this material.

Government Rice Mill.

The Government Rice Mill, which was installed in Brunei town in 1933, ran very successfully during its first season and produced a high percentage of rice of good quality. The support forthcoming from the natives was very satisfactory and there is no doubt that the mill serves a useful purpose and is likely to become of increasing value.

Sago Mill.

A proposal is under consideration by a Chinese to establish a sago mill on the Belait River. The proposal is sound provided some guarantee can be afforded to the factory owner that supplies of sago will be regular. Sago is at present manufactured by the usual native methods.

General.

Coffee. At the Government Experimental Plot at Brakas an excellent stand of seedlings both in pots and in beds has been established from imported seed. Some of the bushes have commenced bearing, but a number shew signs of suffering from excess water. Temporary improvement of drainage can be effected, but satisfactory drainage of the Plot will only be attained when the adjoining Brakas Padi Test Plot is in regular use.

Staff. Two Brunei Malay officers have returned on the conclusion of a course of training at the School of Agriculture, Malaya. Arrangements have been made for the distribution of the work between these two officers.

Part II - Labuan.

Plans have been drawn up and the preliminary work of clearing an area put in hand for the establishment of an agricultural station. A Malay officer

will shortly be put in charge of this work on his return from a course of agricultural training in Malaya.

Progress of agricultural development in Labuan is rather held up for lack of a Malay officer to organise the work. An abortive attempt was made in 1932 to form an agricultural society; it has now been decided to await the arrival of the Malay officer before re-considering the possibility of organising the local small-holders into a society.

The presence of an officer is also required for crop pest and disease control.

Enquiry has been made regarding the poultry industry in Labuan. Further efforts are to be made to investigate the possibility of marketing produce, but it is realised that, on account of inaccessibility, this problem presents many difficulties.

Agricultural progress in Labuan has been extremely slow and the Resident, who fully realises the desirability of improving conditions, has experienced many disappointments. It is felt, however, that with the establishment of the Agricultural Station and the arrival of a trained Malay subordinate, definite progress will be possible.

Miscellaneous Article

THE ALL-MALAYAN PADI COMPETITION.

The first All-Malayan Padi Competition came to a satisfactory conclusion with the final stage, or Central Competition, which was held in conjunction with the recent Eleventh Malayan Exhibition.

The reasons leading up to the inauguration of this competition together with the rules governing it, have already formed the basis of an article in this Journal*, and it is here only necessary briefly to recapitulate the salient points.

The competition is divided into two parts: the local or district competitions and the Central Competition at the Annual Exhibition of the Malayan Agri-Horticultural Association in Kuala Lumpur.

Exhibits, consisting of three gantangs (Imperial gallons) of padi, must be of a strain approved for entry in the Competition, and must bear a statement giving the locality of the holding and size of the area from which the padi was drawn, together with a certificate of yield.

Only the three best exhibits from each local competition are admitted to the Central Competition which, consequently, should comprise the best padi in Malaya.

The general response to the competition was extremely satisfactory and encouraging, the scheme being taken up with considerable enthusiasm in the districts throughout the Federated Malay States and the Settlements of Penang and Malacca. As evidence of this it may be recorded that in Negri Sembilan, thirty-five local shows were held. With such a large number of minor competitions, further selection was necessary and actually some fifty exhibits were entered for the Central Competition.

A report on these local competitions in Negri Sembilan, shows that they have attracted considerable attention and that in some centres, more particularly in the District of Kuala Pilah, the quantity and quality of the samples submitted were of a satisfactory order and competition was keen.

The report points out, however, that the general appearance of the padi bore unmistakable evidence of a wet harvest which was reflected in the presence of immature and undeveloped, and also in many cases, mouldy grain. The almost universal presence of grain moth and weevil was also an indication of insufficient drying prior to storage. It is anticipated that the changes in planting dates arranged in most districts for the forthcoming season, will result in heavier yields and sounder grain.

In Perak, a proposal to hold a State Agricultural Show in Kuala Kangsar on May 10th, the birthday of H.H. The Sultan of Perak, made it possible to give particular prominence to the competition. Twelve local shows were held and care was taken that the number of such shows in each District should be in approximate proportion to the area of padi grown.

The three prize-winning exhibits from each local show were sent to the State Show, and were also eventually entered in the Central Competition, in

* *Malayan Agricultural Journal,* Vol. XXI No. 12, December 1933.

accordance with the rules. The State Show thus served as a supplement to the Central Competition and did much to stimulate local interest.

Some 160 exhibits were received for the Central Competition and were suitably displayed at the Eleventh Malayan Exhibition. Preliminary judging on the day before the Exhibition reduced the number of possible winners to forty, from which twelve were selected for final consideration after prolonged and careful judging.

The exhibits reached a particularly high standard of quality which can be gauged by the fact that the judges were occupied for four hours in dealing with the selected forty exhibits, the final twelve being subjected to further very careful scrutiny and tests before the six awards were made.

Judging was carried out on a basis of 100 marks, allotted as follows:—

1.	Purity of sample	30
2.	Type of grain	20
3.	Condition and uniformity of ripeness ...	20
4.	Condition and uniformity of grains ...	10
5.	Weight per volume	10
6.	Cleanliness	10
		100

Purity of sample is most important as it denotes understanding and care in the selection of seed. An unduly impure sample is eliminated immediately. Items 2 and 3 also apply to preliminary judging more particularly, condition and uniformity of ripeness being an important point as indicating whether the padi ripens evenly and quickly and thus can be harvested rapidly.

The first prize was won by a sample of a high-yielding variety of padi, known locally as "Mayang Sa-Batil", from Balik Pulau, Penang. The grain of this variety is broad, plump and of medium length, with a moderately thin, white husk. The sample was remarkably free from blemishes, even, in size and ripeness and of high density.

This strain of padi is well established in Penang Island. Part of the sample is being used by the Department of Agriculture for planting at the local Padi Test Station during the present season in order to produce material for pure line selection.

The second prize was awarded to a sample of the high-yielding pedigree strain Siam 29 from Malacca. This is a locally selected strain of a variety very popular and widely grown in Malacca. It is a padi maturing in about six months, having a long, somewhat slender, cylindrical grain with a thin, white husk. It has a good flavour and is of good type for milling.

The third prize was awarded to a sample of the well-known Radin variety from the Kuala Kangsar District of Perak. This was almost certainly derived from the pedigree strain Radin 4 which has a slightly humped, fairly broad

grain of medium length, with a reddish brown husk. Radin 4 is a strain of padi maturing in about 7 months and giving a high yield of grain.

The fourth prize was won by a sample of Radin from the Raub District of Pahang, while two samples of Serendah Kuning from the Kuala Pilah District of Negri Sembilan won the fifth and sixth prizes. This latter variety is very popular in the District, but has not yet been subjected to pure line selection. The grain of the prize-winning samples was, however, fairly even in size, uniform in type and of good quality.

It is noteworthy that awards were fairly evenly divided amongst the competing States, thus implying general excellence of the padi entered for competition.

A further point of interest is that one outcome of the Competition has been to encourage the holding of District Agricultural Shows in conjunction with the district padi competition. Thus, Agricultural Shows for various kinds of agricultural products and local handicrafts were held at Balik Pulau, Bukit Mertajam, Telok Anson and Temerloh in the six weeks immediately preceding the Malayan Exhibition.

Although there were on this occasion no exhibits from any of the Unfederated States, the inability of these States to participate was due, in part at least, to the comparatively short period available for organising the competition. Arrangements, which include the distribution of some 4000 gantangs of seed of pedigree strains of padi selected at the Telok Chengai Station from popular local varieties, have already been made for the participation of the State of Kedah in next year's Malayan Competition. It is hoped that certain of the other Unfederated States may also be able to send exhibits next year.

In conclusion, it can fairly be claimed that the competition was an unqualified success and achieved its objects, in that it has stimulated interest throughout Malaya in padi planting and has ensured that the prize-winning exhibits at the Malayan Exhibition definitely represent the best padi in Malaya.

Abstract.

PRUNING OF TEA IN RELATION TO ESTATE PROFITS *.

It has always been realised that it is possible to reduce the yield and capital value of tea bushes by gross errors in pruning, but what is not realised is that the value of the methods in every-day use vary to an extraordinary extent according to the elevation of the estate and the climate it enjoys.

Dr. Gadd at the Tea Conference of 1929 showed that, in his experience, a deficiency of starch in the roots was the predisposing cause of death after pruning, and that the fungus *Botryodiplodia Theobromae* was of minor importance, merely playing a secondary part in attacking bushes already dying from physiological causes. One line of Mr. Tubb's work at Galatura and in the laboratory at St. Coombs has been the confirmation of his work and its extension to include dieback and the investigation of its effect on yield and growth.

He collected sixty-nine samples of roots from tea of approximately eighteen months after pruning from all over the tea districts. An examination of the total carbohydrates extractible by a standard acid extraction showed that the percentage of carbohydrates in the roots varied according to the elevation of the field of tea, and that when plotted against elevation the points tended to fall on to a straight line. This line, when statistically calculated, showed that, on the average, the percentage of carbohydrates rose from 10.13 per cent. at sea level by 0.232 per hundred feet to 26.37 per cent. at an elevation of 7,000 feet. In other words, the highest tea in the Island has more than two and a half times as much carbohydrates in the roots as the lowest. By no means all the carbohydrates extracted by the acid treatment used are available for use in recovery after pruning. Bushes that have died after pruning commonly contain about twelve per cent. Thus, unless the bushes at pruning time contain a balance over this amount when pruned, the food is not available to enable new shoots to be produced, and death, partial or complete, must follow.

The probable fundamental cause of this difference in the size of the carbohydrate balance at different elevations is temperature. Temperature falls by approximately three and a half degrees Fahrenheit for every thousand feet of higher elevation. The higher the temperature, the greater the rate of photosynthesis, growth, and respiration of a plant. Photosynthesis is the process of carbohydrate manufacture, and the higher temperatures of the Low-country will speed up the process during the hours of the day in which light is available for the process. But the breakdown of carbohydrates by respiration is also speeded up—and this proceeds throughout the twenty-four hours, instead of for only about twelve hours a day. In addition, the enhanced growth rate calls for more carbohydrates to be used directly in building up leaves, stems, and roots instead of being stored up as reserves.

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* Abstract of a lecture given before the Sabaragamuwa District Planters' Association, by F. R. Tubbs of the Tea Research Institute of Ceylon and published in *The Tea Quarterly*, Vol. VII, Part I, February 1934.

Thus, as a result of climatic differences, the bush at a high elevation contains within its roots ample reserves to enable its recovery from pruning, while those at low elevations do not.

Manuring and cultivation have sometimes been suggested as remedies. Manures have their very distinct place in the scheme of maintaining the health of the bush, but what is wanted in the Low-country at pruning time is carbohydrates within the bush. Leaves are the organs for manufacture of these substances and it follows that, if the bush has not sufficient carbohydrates stored up by the end of its cycle to enable full and healthy recovery from pruning, it must not be deprived of its sole source of fresh supplies.

Leaves must be left on the bush at pruning time in such cases. Mr. Tubbs states that he would adopt this procedure at any elevation below 1,500 feet above sea level. Any form of cut-across gives the desired result, but this method suffers from two disadvantages. Firstly, often insufficient leaves are left, and secondly, any dead or diseased wood cannot be efficiently cleaned out. Lung pruning allows of sufficient leaves being left on, and also for efficient and careful cleaning out of the interior of the bush at pruning.

The number of leaves which should remain on the bush depends upon the reserves the bush already possesses. At the lowest elevations well over three hundred leaves should be left. It is not accurate enough to say three or six lungs should be left, for their value depends upon the area of leaf surface upon them. But a count of the leaves left on a few bushes soon gives one an idea of the number remaining which proves a better estimate of leaf areas. At higher elevations progressively fewer leaves will be needed.

Beneficial results from lung pruning can be proved. Taking first the question of the yield of flush from rim lung and clean pruned plots. The cycle of two years of the Galatura experiment will not be complete until the end of April, but it is obvious from the yields to date that pruning in such a way as to leave about two hundred leaves per bush on the lungs till about ten days before tipping has resulted in an increase of crop of over 200 pounds per acre to date. This more than compensates for the extra two or perhaps three rupees an acre required for pruning.

These results on yield are not of prime importance at the moment owing to restriction, but they will be definitely important when restriction ends. The fact that these results were obtained in the first cycle is stressed. It is reasonable to expect that there will be cumulative effects and, if these are of any magnitude, even more striking results may be expected in the future. The continuation of the experiments will decide the point.

There is no evidence to date of any loss of quality due to this enhanced yield, and as the difference in yield appears to be due at least in part to dieback, there is no rational reason for expecting it.

The yield of a tea estate affects both the total revenue coming in and also the cost per pound of putting the tea on the market. But the profit available for distribution is always reduced by the amount of the expenditure required

to maintain the estate in good order as a commercial proposition. It stands to reason, therefore, that if one can, to some extent, reduce the wear-and-tear on the bushes—a smaller proportion of the gross profits will be absorbed in replacement and in restoring the bushes to good health. It is essential, therefore, to consider not merely the effect of pruning on yield, but also its effect on the maintenance of the capital value of the plant.

In 1932 there were published in *The Tea Quarterly* figures concerning the effect of the method of pruning on the number of deaths after pruning and the amount of dieback in the Low-country. Perhaps owing to the impression that variations in pruning had little effect on yield or profits, the article caused little comment in planting circles. It was shown that the number of deaths per acre, reckoning 3,000 bushes to the acre, was one hundred and thirty-four in the clean pruned plots and only sixteen in the rim lung pruned plots. These figures are sufficiently startling, but in addition there is now data from an experiment at Galatura performed in 1933. In this experiment were observed the effects of (*a*) 6 lungs left of the bush either one or two months after pruning, (*b*) 3 lungs left on the bush for either one or two months after pruning and (*c*) clean pruning. Six lungs carried an average of 327 leaves, three lungs 203, while clean pruning left an average of 3 leaves.

It was found that the six lung treatment resulted in only 22.5 deaths, compared with 28.2 for three lungs and 168.6 for clean pruning per acre of 3,000 bushes. In other words, 327 leaves remaining on the bush for part of the recovery period resulted in decreasing the number of deaths by eighty-seven per cent.

This, as is obvious, has a considerable bearing on estate profits. If replacement of a bearing tea bush costs fifty cents per bush, the 1932 experiment showed a saving of Rs. 59 per acre and the 1933 experiment a saving of Rs. 74 per acre in capital value.

The effect of method of pruning on the health of the bushes that survive has also to be considered. After pruning, the bush may not die completely—it may suffer death of some of its frame branches only. This reduces yield, and provides entrances to disease organisms which bring in their train a whole series of losses. Measurements to date have shown that up to twelve hundred pounds of dead wood per acre may be removed after pruning and even this high figure is sometimes considerably exceeded over small areas. The amount of pre-tipping dieback can be reduced considerably by lung pruning. The figures obtained per thousand bushes were

Clean prune	...	...	236.9 pounds.
3 lungs	...	...	127.3 „
6 lungs	...	...	109.5 „

The method of pruning does not appear to affect the amount of post-tipping dieback, however.

These figures, as might be expected, are reflected in the recovery after pruning. The dry weight of material removed in tipping provides an index of recovery. The weight of tippings from the six lung treatments is more than double that from clean pruning, with the three lung treatment occupying an intermediate position.

It is interesting to note that there is significant evidence that if only about two hundred leaves per bush are left on the lungs, they should be left on for at least two months, whereas with three hundred leaves per bush the lungs can be removed earlier without disadvantage. Figures also effectually contradict the fear that is sometimes expressed that the growth of the lungs is prejudicial to the production of tipping shoots in the centre of the bush.

To sum up, one may, by providing plenty of leaves on the bush during the period immediately following on the pruning operation, reduce the number of deaths and the amount of dieback and increase the rate of recovery and subsequently the yield of the tea by amounts which are sufficiently great to be of considerable importance.

Reviews.

Egg Weight in the Domestic Fowl.

E. M. Funk and H. L. Kempster. Agr. Exp. Stat. Bull. 332, Univ. Missouri Coll. of Agr. Columbia, Missouri, Feb. 1934. 15 pp.

With the growing tendency towards the buying of eggs on a graded basis, the demand for information on egg grades has increased. This Bulletin recounts the investigations on this subject at the Missouri College of Agriculture, and although climatic conditions are dissimilar to those obtaining in Malaya, the conclusions are of value and should serve as a basis of similar enquiry in this country.

The authors find that the weight of eggs laid by pullets during their first few months of production is very definitely related to the month in which sexual maturity occurs. Maximum egg weight was reached during February by pullets which began laying in any of the months from September to February. In other words, maximum weight of egg was obtained during the natural breeding season. It is doubtful whether in Malaya, with its equable climate, a similar relationship could be found, or if found, whether it would be so marked.

The age at which the pullet began to lay influenced the weight of eggs laid. Calculations made to eliminate the influence of body weight shewed that the age at sexual maturity significantly influences egg weight. Egg weight is also influenced by body weight.

Egg weight increases from the first egg to the next few eggs laid, the increase gradually diminishing until the mean egg weight is reached by the time the thirtieth egg is laid.

Eggs produced in the morning are very definitely larger than those laid during the afternoon. This relationship is attributed to the fact that the first eggs laid in a given clutch are larger and are produced in the morning.

The authors show that eggs of maximum weight are produced in the spring months, while smaller eggs are laid during the summer months. They refer to the work of Dr. D. C. Warren of the Kansas State Agricultural College who has shewn that high temperatures cause birds to produce smaller eggs. It is uncertain from the authors' investigations, whether their results in this respect are due to the breeding season factor or to temperature. This question of temperature is one of great importance in Malaya. The results indicate the great value of providing cool quarters for the birds and adequate shade.

The position of the egg in the clutch (group of eggs laid in consecutive days) influences the weight of eggs. The following facts emerge from a study of this factor. The first egg of a clutch is usually the largest laid in that clutch; but if the first egg laid in a clutch followed a rest period of 7 days or longer, it was usually smaller than the other eggs in that clutch. It was also observed

that the decrease in weight per egg was greatest in the shorter clutches and that the total decrease from first to last egg was not materially greater in the longer clutches.

Furthermore, if the first egg in a clutch was a large egg, the decrease in weight of succeeding eggs was much greater than if the first egg laid was a small egg.

The decrease of egg weight within a clutch was greatest during the spring months and least during the colder months.

The largest eggs produced at the Station were those laid by Rhode Island Reds. Within a breed, however, there is a wide variation in the weight of egg produced. These differences may be established by breeding and become strain differences. Large egg size is not confined to any one breed, but can be bred into any of the common breeds.

Egg weight is an inheritable factor. Results of investigations with White Plymouth Rocks shewed that dams which lay large eggs tend to produce daughters which also produce large eggs; similarly, dams which lay small eggs tend to produce daughters with the same character. Egg weight is no doubt also inherited from the male.

Egg weight may be influenced by the ration. It has been shewn that birds receiving milk laid larger eggs than did those receiving meat scrap, tankage, soyabean meal, cottonseed meal, or ground soyabeans. The use of mineral supplements—such as oyster shell, or ground limestone—increases egg weight. Since body weight is related to egg weight, the maintenance of body weight by proper feeding methods would no doubt be helpful in maintaining egg weight. The maintenance of body weight is also essential for high egg production. Stimulation of egg production by the use of artificial lights has not affected egg weight.

In reviewing this work in the light of poultry keeping in tropical regions, two important points emerge; the provision of a well-balanced ration and adequate housing. Seasonal differences there probably are, but local investigation on the lines described by the authors is necessary to identify them. They are important, however, especially to enable the poultry-keeper to estimate how far egg production and size of egg are influenced by factors over which he has no control and how far they are capable of adjustment by the exercise of his care in breeding, housing and feeding.

D. H. G.

Farm Poultry Production.

L. E. Card and M. H. Henderson. 202 pp. 1933. Illustrated.
Obtainable from Messrs. N. K. Paul & Sons, Post Box No. 12202. Calcutta.
Price Rs. 17.8.0 plus postage.

The object of this text book is to afford a working knowledge of the principles underlying practical poultry keeping, as applied in those sections of the United States where poultry is an important part of the farm business, but where specialised poultry farming is rather uncommon. The treatment is thus biased in favour of the keeper of the smaller-sized flocks.

The book is divided into eight chapters as follows—The Business of Poultry Keeping, Judging Fowls for Egg Production, Feeding, Housing, Maintenance, Hatching and Rearing, Marketing, and Breeding. In these, the subject matter is presented in a very readable manner, and the whole book is admirable on account of its directness, simple language and good definitions. The theory underlying feeding and breeding is simply, yet adequately explained, and the intelligent student of poultry keeping and the beginner should have but few difficulties with the text.

Naturally, due to the very different climatic and economic environment for which it was written, a certain proportion of the information incorporated is not capable of direct local application. This applies particularly to the details of rations and housing construction, and to the chapter on the marketing of poultry produce. In all the chapters, however, the underlying general principles are explained in such a manner that they can readily be interpreted and applied in terms of local conditions. Similarly, most chapters are noteworthy for their content of information on practical matters which very often puzzle the beginner, *e.g.* how to handle and cull.

The book is essentially one for the student and amateur poultry keeper, and not for the expert, but it should also prove of considerable value to the teacher of poultry husbandry in aiding to draw up a course of lectures and practical work suitable to local conditions.

V. C. D.

Departmental.

FROM THE DISTRICTS.

June, 1934.

Compiled by the Chief Field Officer from Monthly Reports submitted by Field Officers.

The Weather.

The rainfall in the inland area on the west of the Peninsula from South Kedah to the Negri Sembilan border, in Krian District, in the Districts of Bentong and Temerloh in Pahang, and in the Johore Bahru and Kota Tinggi Districts of Johore was above average for the month of June, and was about double the average in the central portion of the Peninsula close under the western side of the main range, while at Cameron Highlands it was as much as three times greater than the previous average for the month. In North Kedah, however, and on much of the western coast, as well as on the east coast of Kelantan and Pahang, it was below average to a varying extent, as for example in the Muar District of Johore, where the drought of the previous two months continued. Elsewhere rainfall was normal, except in Singapore Island where sudden and somewhat severe storms during an otherwise hot dry month produced a rainfall well above the average. In much of the country, conditions became dryer during the last week of the month.

Remarks on Crops.

Rubber.—During the first month of the restriction scheme prices have been steadier than those obtaining during May. The lowest and highest prices in dollars and cents per picul for rubber from small holdings were: Smoked Sheet $18 to $27; Unsmoked Sheet $15 to $25, prices below $18 being exceptional. Corresponding prices for May were $16 to $34 and $12 to $31.50. The Singapore price for Smoked Sheet was $26, while the Penang price for Unsmoked Sheet ranged from $22 to $23.50 per picul as compared with $24 to $31.50 in May. Although the Singapore price for scrap rubber was $11 and the price range in Kedah and Province Wellesley was $10 to $15 per picul, there was no demand for this grade in the greater part of the Peninsula and in the few localities where sales were effected, prices varied from $2 to $9 per picul.

Production for the month from small holdings was limited to the quota enforced by the operation of the restriction scheme, but is likely to have been further curtailed in some areas by the effect of wet weather in preventing tapping and by the fact that it was not possible to complete the issue of coupons in all Districts.

Conditions of upkeep on small holdings continued to improve. Weather conditions favoured the incidence of bark diseases, but the use of satisfactory measures of control continued to become more general. It was recorded in Province Wellesley and Singapore Island that infected trees were often left untapped, because the quotas permitted by the export coupons could be obtained by tapping only the healthy trees.

Padi.—The price of padi at the Government Rice Mill, Bagan Serai, was reduced to $1.25 per picul towards the end of the month. In Kedah there was a further slight rise in the price which was equivalent to $1.10 to $1.17 per picul in Kota Star District, while in Province Wellesley the range was $1.10 to $1.50 per picul. Elsewhere there was little change, the quotations varying from 5 to 12 cents per gantang.

Preparation of the land and the planting of nurseries was commenced in accordance with the prescribed programmes in several parts of the country, of which the more important were the north and central portions of Kedah and Province Wellesley and the north western area of Krian District.

In Kedah over 4,000 gantangs of seed of certain high-yielding pure strains of padi were distributed, either in exchange for an equal quantity of unselected seed or by sale at 5 cents per gantang; such distribution forms part of the programme for the Padi Competition to be held in that State at the close of the present season.

Coconuts.—There was a further slight improvement in the average price of copra, the range in different localities being $1.10 to $3 per picul. The Singapore price was about $2.50 as compared with $2.40 per picul in May.

The first sale of copra prepared on the new Government-aided kiln at Sri Menanti in the Muar District of Johore realised an average price of $2.98 per picul f.o.b. Muar. This price was 50 cents per picul higher than the local figure and was considered very satisfactory.

Increase in the internal trade in fresh nuts is reported, as for example between the Krian and Larut Districts of Perak and between Pontian and Johore Bahru in Johore. It is also reported that there is at present a profitable export trade in fresh nuts from part of the west coast of Johore by way of Singapore to China.

Pineapples.—Fresh fruit was plentiful and cheap during the month. Price ranges in Johore were: first quality $1.10 to $1.50, second quality 90 cents to $1.10, and third quality 50 cents to 60 cents per hundred. Corresponding prices in Singapore were $1.60 and 50 cents. In Johore 8, in Singapore 5 and in Selangor 2 factories were working full time.

There was some tendency for fruit to be over-ripe, as growers were holding back supplies in the hope of better prices.

Inspection of the area of some 2,000 acres of pineapples at Mandai in Singapore Island showed that most of the fruits obtained were small, varying in weight from about 2½ to 3 lbs. each. This is not surprising as the plants

are 4 years old, have been grown without manure and with no precautions to prevent soil erosion.

From Johore it was reported that Chinese squatters were going further afield in search of land for pineapple cultivation and had commenced to clear abandoned *lallang* grass land beyond the 30th mile on the Johore—Ayer Hitam road.

Fruit.—Durians, mangosteens, rambutans and chempedaks were in season in Penang and Province Wellesley. Crops were only moderate and prices in consequence were good. The durian crop was light in Kedah. Durians were also fruiting in Selangor and were in season with mangosteens in Singapore Island, but in Malacca were just beginning to ripen. A poor season for mangoes and horse-mangoes concluded in Malacca and a small crop of horse-mangoes was harvested in Negri Sembilan.

Tobacco.—Prices for sun-dried leaves have remained much the same as in May, being high at $30 to $70 per picul in Malacca, Johore and Kelantan, and low at $9 to $25 per picul in Kedah, the range elsewhere being $15 to $40 per picul.

In one district of Malacca the planted area has diminished owing to the impossibility of continuous cropping on the same land. In Kedah a further 22 acres were planted. In Kluang and Batu Pahat Districts of Johore there has been some additional planting, while small scattered plots have also been planted in parts of Selangor and Pahang for local consumption. There is still a considerable planted area in Central Perak.

Agricultural Stations.

The monthly output of made tea from the Tanah Rata Experiment Station during the last six months has averaged about 1,380 lbs. The rate of yield from the area in plucking has been about 630 lbs. per acre from the bushes averaging 6 years old and 300 lbs. per acre from the younger bushes about 3 years old, the age being reckoned in each case from the date of planting in the field.

At the Pineapple Experiment Station in Singapore, the results of the manurial experiment for the period August 1932 to April 1934 indicate that on this soil significant increase in the number of fruits were obtained from applications of various mixtures of fertilisers and from cattle manure. Phosphate was found to be essential. The plots receiving lime only and pineapple refuse only gave no increase. The results also indicate that the effect of manures is practically exhausted 18 months after application.

Poultry keeping has been commenced at the Kuala Lipis Agricultural Station with six pullets and one cockerel of the White Wyandotte breed received from the Pineapple Station, Singapore.

Padi Stations and Test Plots.

Nurseries were established and cultivation of the land commenced at the Telok Chengai Station in Kedah, Titi Serong and Talang Stations in Perak, the Central Experiment Station in Kelantan and thirteen other Test Plots in various parts of the country. The latter include newly-acquired Test Plots in the Bagan Serai mukim of Krian District and the Kuala Lipis District of Pahang.

The crops planted at the Bukit Merah Test Station in Province Wellesley during the interval between padi seasons were nearing maturity. The best growth was shown by brinjals, chillies, ladies' fingers and tobacco.

At the Kilanas Station in Brunei in the Radin Siak Latin square the three strains Rs. 17, 18 and 24 were all significantly superior to Rs. 7.

Poultry.

Two flocks of birds were destroyed in Krian District during April by a disease diagnosed as *Diptheritic Stomotopharyngitis.* In June, there were outbreaks of disease in the Selama and Tanjong Malim Districts of Perak. The cause of the former was not diagnosed, the latter is still under investigation by the Veterinary Department. Three other outbreaks occurred in the Kuala Lipis District of Pahang, specimens from which were obtained by the Veterinary Department for examination. In the Kota Tinggi District of Johore fairly heavy loss was occasioned by disease in three areas where numbers of birds are reared for the Singapore market. This outbreak was reported to the Veterinary Surgeon. Weather conditions may have been a predisposing factor, since storms of wind and rain were prevalent during the month.

A few Malays have started erecting improved types of poultry houses and others have obtained from the Agricultural Stations pure bred or half bred cocks with a view to improving their stock of birds.

Malayan Exhibition.

The remarkable success obtained by competitors from the Settlement of Penang in the agricultural section of the recent Malayan Exhibition is illustrated by the fact that the Settlement received no less than 50 first and 50 second prizes. These included, in addition to the first prize in the All-Malayan Padi Competition, the first prize for copra from small holdings and the first prize for hill padi. A Chinese land-owner in Penang Island obtained no less than 10 first and 4 second prizes, including first prizes for cloves, nutmegs and black pepper.

Rural Lecture Caravan.

The Rural Lecture Caravan visited the Larut District of Perak for the period June 14th to 25th inclusive. The demonstrations, which dealt mainly with poultry keeping and control of mouldy rot disease of rubber, were well attended.

DEPARTMENTAL NOTES.

Death of Inche Mohamed Ali bin Mohd. Said.

We have to record with regret the sudden death of Inche Mohamed Ali bin Mohamed Said, Malay Agricultural Assistant, which took place on 4th June, 1934.

Inche Mohamed Ali joined the Department of Agriculture in 1928. At the time of his death he was a promising member of the laboratory staff. His early demise is regretted by his large circle of friends and colleagues at the Department.

Tour of Director of Agriculture.

The Hon'ble The Director of Agriculture, S.S. and F.M.S. visited Singapore and Johore with the Vegetable Oils Committee from 7th to 10th June inclusive. Meetings were held at Singapore, Kukub, Batu Pahat and Muar.

Conference of Field Officers.

A meeting of Field Officers was held in Kuala Lumpur on 4th June 1934 and the following is a brief résumé of the more important points discussed.

Poultry.—The policy to be adopted in relation to the distribution of poultry from Agricultural Stations was discussed.

Among other decisions made it was agreed that it was essential to distribute selected poultry and that three-quarter-bred cocks should be raised for experimental distribution, such birds as were distributed to be kept under observation.

It was also decided that pure-bred hens may be sold, provided that prospective purchasers already possess a pure-bred cock. A list of prices to be charged for stock was drawn up, reduced prices being allowed to approved small-holders.

All-Malayan Padi Competition.—The rules for this competition were considered and amended in the light of experience gained during the first competition recently completed.

Asiatic Rubber Instructors.—The scheme and course of training of these instructors was outlined. Although actually officers of the Rubber Research Institute of Malaya, it was agreed, in order to obtain closer liaison between that Institute and the Department of Agriculture, that the Instructors should work directly under the field officers of the latter Department.

Small-holders' Rubber.—A scheme was proposed and discussed for a competition for small-holders' rubber on the lines of the All-Malayan Padi Competition with local shows and a Central Competition at the Annual Malayan Exhibition.

Appointments.

Mr. C. H. Burgess, B.Sc. (Agr.) has been appointed an Agricultural Officer from 11th May. He arrived in Malaya and assumed duty on 9th June, 1934.

Mr. Burgess will be stationed at Kuala Kangsar as Agricultural Officer, Perak Central.

Mr. W. G. Higgins, Assistant to Statistician, has been appointed an Agricultural Field Officer on a temporary basis from 29th April, 1934.

Leave.

Mr. J. H. Dennett, Assistant Chemist (Soils), has been granted 7 months and 7 days full-pay leave from 13th June 1934, inclusive.

Mr. J. W. Jolly, State Agricultural Officer, Pahang, has been granted 9 months and 1 day full-pay leave from 19th June 1934, inclusive.

Major C. D. V. Georgi, O.B.E., Assistant Agricultural Chemist, has been granted 8 months and 24 days full-pay leave from 23rd June 1934, inclusive.

Agricultural Leaflets.

A new series of Agricultural Leaflets is in course of preparation and when complete will comprise the following:—

1. Tuba Root
2. Gingelly
3. Tobacco
4. Groundnut or Peanut
5. Bananas
6. Cover Crops
7. Green Manures
8. Fodder Grasses
9. Pepper
10. Coffee.

Of these Nos. 1, 2, 4, 5, and 9 have already been published and will be supplied free of charge on application to the Department of Agriculture, S.S. and F.M.S., Kuala Lumpur.

Statistical.

MARKET PRICES.

June, 1934.

Rubber.—The price of rubber was reasonably stable during June and improved from 20 cents per lb. for spot loose in Singapore to $22\frac{5}{8}$ cents per lb. at the close. The average price for the month in Singapore of smoked sheet, equal to London Standard was 21.82 cents per lb. as compared with 21.35 cents per lb. in May. In London the average price in June was 6.46 pence per lb. and in New York 13.36 cents gold per lb. as compared with 6.38 pence and 11.94 cents gold respectively in May.

Weekly prices paid during June for small-holders' rubber at three centres are shown in Table II.

Palm Oil.—The market has again dropped and its course during June is shewn in the following table of the Malayan commodity: basis 5 per cent. f.f.a.

Table I.

DATE	PALM OIL		KERNELS
	L'Pool/Holland/ Hamburg c. i. f. landed weights in bulk per ton £. s. d.	L'Pool/Continent c. i. f. per ton net in barrels £. s. d.	Fair Average Malayan Quality c. i. f. Landed Weight per ton on Continent. £. s. d.
June 6	8 15 0	11 10 0	5 15 0
„ 13	9 0 0	11 10 0	5 15 0
„ 20	9 0 0	11 10 0	5 15 0
„ 27	9 0 0	11 10 0	5 15 0

Copra.—The price of copra in Singapore again appreciated slightly during June, closing at $2.95 for sun-dried copra, after touching $3.00. The average price for the month of this grade was $2.93 as compared with $2.83 for May. The mixed quality averaged $2.51 as compared with $2.35 in the previous month.

Copra cake continued to be quoted at $1.00 a pikul throughout the month.

Rice.—The average wholesale prices of rice per picul during May were as follows:—Siam No. 2 (ordinary) $2.60, Rangoon No. 1 $2.42, Saigon No. 1 (long grain) $2.50 as compared with $2.54, $2.42 and $2.57 respectively in April. Corresponding prices in May 1933 were $3.57, and $2.92 for Siam No. 2 and Rangoon No. 1 respectively.

The average retail market prices in cents per gantang of No. 2 Siam rice in May were:—Singapore 23, Penang 25, Malacca 23 as compared with 23, 25 and 24 respectively in April.

The average declared trade value of imports of rice in May was $3.10 per picul as compared with $3.11 in March and $3.00 in April of this year.

Tea.—The London price quoted for Malayan tea during May was 1s. 1½d. per lb. Average London prices per lb. during May for tea consignments from other countries were as follows:—Ceylon 1s. 2.93d., Java 11.97d., Indian Northern 1s. 1.58d., Indian Southern 1s. 2.27d., Sumatra 11.54d. Prices generally shewed some decline over those ruling during the previous month.

Tuba Root (*Derris*).—Prices continue to advance. The average price during June for roots of good ether extract was $30.50 per picul. Roots sold on rotenone content averaged $40 per picul.

Coffee.—The Singapore price of coffee weakened during June. Sourabaya coffee dropped from a range of $20 to $21 per picul according to grade, to $19 to $20 and Palembang coffee dropped from $13.50 per picul to $12.50, an average of $12.85 as compared with $16.19 in May.

Arecanuts.—Singapore average prices per picul during June were as follows:—Splits $2.75 to $4; Bila Whole $2.60; Sliced $12.50 to $16.35; Red Whole $4 to $5.65; Sourabaya Whole $4.35 to $5.90; Kelantan Whole $3 to $3.63, the price within each range depending upon quality.

The average prices per picul quoted by the Singapore Chamber of Commerce were:—Best $4.06, Medium $3.71, Mixed $3.07.

Gambier.—Singapore prices have weakened slightly since the beginning of June, but the average price for Cube No. 1 for the month was $7.30 per picul as against $7.19 in May, while the average price for Block dropped to $4.05 from $4.25 for May.

Pineapples.—Rather more enquiry in London early in the month resulted in a small temporary advance, the demand tending to slacken towards the close ot the month. The average price of Cubes per case for June was $3.01 as compared with $3.02 in May but Sliced Flat and Sliced Tall grades both shewed a slight increase at $3 and $3.12 respectively as compared with $2.97 and $3.07 in May.

Tapioca.—Singapore prices opened at the May level but eased off considerably during the month. Average prices per picul were Flake Fair $4.33, Pearl Seed $5.86, Pearl Medium $6.20 as against $4.60, $5.91 and $6.37 respectively in May.

Sago.—The Singapore market in this commodity during June resembled that for tapioca. Average prices per picul were Pearl, Small Fair $4.17 and Sarawak Fair $1.86 as compared with $4.76 and $1.90 in May.

Mace.—The Singapore market for mace and nutmegs continued dull and featureless during June. Prices remained steady at $70 per picul for Siouw and $50 per picul for Amboina, unchanged as compared with May.

Nutmegs.—The Singapore prices per picul were steady during June at $22.53 for 110's and $23.50 for 80's. The corresponding average prices in May were $22.50 and $23.

Pepper.—The market settled down again after the May fluctuations and prices eased off considerably. London stocks seem to increase steadily. Singapore average prices per picul in June were :—Singapore Black $14.85, Singapore White $33.60, Muntok White $34.40 as compared with May average prices of $16.19, $34.75 and $35.75 respectively.

Cloves.—Prices in Singapore continued nominal at Zanzibar $35 and Amboina $45 per picul.

Table II.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, June, 1934.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.			Kuala Kangsar, Perak.				Batu Pahat Johore
	7	14	21	6	13	20	27	27
Smoked sheet			24.50					
Unsmoked sheet	22.62	23.19	23.45					22.56
Rubber*				20.00	22.84	22.00	22.00	

* Wet unsmoked sheet.

Transport by lorry Kuala Pilah to Seremban 15 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases at Batu Pahat on 6th, 13th and 20th June or at Kuala Pilah on 28th June.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Mackey & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY.*

May, 1934.

Malaya.—The imports into Malaya of foreign rice during May were 49,534 tons and exports 11,688 tons, net imports accordingly being 37,846 tons. The net imports for the period January to May 1934, were 186,155 tons, an increase of 10.1 per cent. over the corresponding five months of 1933.

Of May imports, 47 per cent. were consigned to Singapore, 21 per cent. to Penang, 5 per cent. to Malacca, 20 per cent. to the Federated Malay States and 7 per cent. to the Unfederated Malay States. Of the total, 65 per cent. came from Siam, 33 per cent. from Burma, 1 per cent. from French Indo-China and 1 per cent. from other countries. Of the exports during May, 67 per cent. were shipped to Netherlands India and 33 per cent. to other countries.

The various kinds of rice exported were:—Siam 7,460 tons (64 per cent.), Burma 3,575 tons (31 per cent.), Indo-China 454 tons (4 per cent.), India 39 tons, local production 160 tons (1 per cent.)

India, Burma and Siam.—Latest information available published in the Summary for April, 1934.

Japan.—According to the Ministry for Agriculture and Forestry (*Trans-Pacific Journal*, 17 May, 1934) the stocks of rice in Japan Proper on 1 May, 1934, amounted to 6,406,310 tons.

The demand and supply of rice during the period 1 May, 1934 to 31 October, 1934, were estimated as follows:—

Supply:	Stocks on 1 May, 1934	... ...	6,406,310 tons
	Imports of Korean rice	... ...	434,780 „
	Imports of Formosan rice	... ...	322,580 „
Demand:	Six months' consumption (May/October)	... ..	4,679,240 tons
	Exports	... ...	70,130 „

shewing a surplus of 2,414,300 tons.

French Indo-China.—Entries of padi into Cholon, January to May, 1934 totalled 598,252 metric tons as compared with 599,508 metric tons during the corresponding period in 1933, a decrease of 0.2 per cent. Exports of rice for the same period this year were 664,724 metric tons, as compared with 652,116 metric tons for the corresponding period in 1933, or an increase of 1.9 per cent.

Netherlands India.—According to the *Economic Bulletin* dated 16 May, 1934, the area of padi harvested (wet and dry) in Java and Madoera during February, 1934, amounted to 541,671 acres, as compared with 422,617 acres in the corresponding period of 1933, an increase of 28 per cent.

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* Abridged from the Rice Summary for May, 1934, compiled by the Department of Statistics, S.S. and F.M.S.

Ceylon.—Imports for the first five months of 1934, totalled 194,942 tons, an increase of 8.1 per cent. as compared with the total of 179,182 tons for the same period in 1933.

Of these imports, 15 per cent. were from British India, 65 per cent. from Burma and 20 per cent. from other countries.

Europe and America.—Shipments to Europe from the East were 512,230 tons for the period 1 January to 17 May, 1934 as compared with 592,900 tons for the corresponding period in 1933, a decrease of 13.6 per cent.

Of the 1934 shipments 42 per cent. were from Burma, 3 per cent. from Japan, 40 per cent. from Saigon, 11 per cent. from Siam and 4 per cent. from Bengal. The corresponding 1933 percentages were 50, 4, 38, 7 and 1 per cent. respectively.

Shipments from the East to the Levant during the period 1 January to 26 April, 1934, were 16,360 tons as compared with 13,891 tons for the same period in 1933, an increase of 17.8 per cent.

To the West Indies and America, 46,385 tons were shipped from the East in the period January to May, 1934, as compared with 40,745 tons during the corresponding period in 1933, an increase of 13.8 per cent.

MALAYAN AGRICULTURAL EXPORTS, MAY, 1934.

PRODUCT.		Net Export in Tons.				
		Year 1933.	Jan.-May 1933.	Jan.-May 1934.	May 1933.	May 1934.
Arecanuts	...	20,756	9,185	15,521	1,236	2,974
Coconuts, fresh	...	100,609†	37,665†	37,735†	7,013†	6,250†
Coconut oil	...	17,568	7,907	10,750	1,595	2,419
Copra	...	110,543	35,751	38,352	6,591	5,023
Gambier, all kinds	...	2,560	1,040	913	291	220
Palm kernels	...	1,983	612	1,142	194	280
Palm oil	...	12,101	3,753	4,950	1,452	1,038
Pineapples canned	...	59,582	24,577	29,514	6,942	8,854
Rubber	...	459,836§	149,653§	210,672§	33,461§	46,769§
Sago,—flour	...	7,648	1,836	4,131	307	728
„ —pearl	...	2,646	886	1,775	221	468
„ —raw	...	4,420*	1,688*	2,400*	271*	637*
Tapioca,—flake	...	9,881	5,112	3,585	977	613
„ —flour	...	702*	181*	898*	137*	227*
„ —pearl	...	17,297	6,952	6,852	1,352	1,606
Tuba root	...	569½	182	258½	56	43

† hundreds in number. * net imports. § production.

MALAYA RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING MAY, 1934.

STATE OR TERRITORY	Acreage of Tappable Rubber end 1932 (d)	ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		ESTATES WHICH HAVE PARTLY CEASED TAPPING		AREA OF TAPPABLE RUBBER NEVER BEEN TAPPED		Total (3) + (5)	Percentage of (9) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STRAITS SETTLEMENTS:—									
Province Wellesley	44,734	1,106	2.5	7,717	17.2	872	1.9	8,823	19.7
Dindings	6,,969	112	1.6	1,287	18.5	506	7.3	1,399	20.1
Malacca	111,780	4,254	3.8	20,092	18.0	4,303	3.9	24,346	21.8
Penang Island	1,635	260	15.9	332	20.3	7	0.4	592	36.2
Singapore Island	28,269	4,837	17.1	4,506	15.9	738	2.6	9,343	33.0
Total S.S. ...	193,387	10,596	5.5	33.934	17.5	6,426	3.3	44,503	23.0
FEDERATED MALAY STATES:—									
Perak	250,951	4,747	1.9	40,192	16.0	13,893	5.5	44,939	17.9
Selangor	308,379	3,024	1.0	47,763	15.5	13,406	4.3	50,787	16.5
Negri Sembilan	228,541	9,171	4.0	37,069	16.2	19,950	8.7	46,240	20.2
Pahang	38,141	2,492	6.5	11,366	29.8	6,132	16.1	13,858	36.3
Total F.M.S. ...	826,012	19,434	2.4	136,390	16.5	53,381	6.5	155,824	18.9
UNFEDERATED MALAY STATES:—									
Johore	325,747	16,672	5.1	27,678	8.5	21,498	6.6	44,350	13.6
Kedah (a) (b)	126,588	10,292	8.1	12,704	10.0	15,574	12.3	22,996	18.1
Kelantan	21,176	1,209	5.7	5,572	26.3	3,758	17.7	6,781	32.0
Trengganu (c)	4,643	Nil	Nil	186	4.0	186	4.0	186	4.0
Perlis (a) (b)	957	159	16.6	192	20.0	318	33.2	351	36.6
Total U.M.S. ...	479,111	28,332	5.9	46,332	9.7	41,334	8.6	74,664	15.6
TOTAL MALAYA ...	1,498,510	58,335	3.9	216,656	14.4	101,141	6.7	274,991	18.3

Notes:—(a) Registered companies only and are rendered quarterly.
(b) The figures quoted for Kedah and Perlis are those for end December 1933, and Kelantan end January, 1934. Revised figures will be published when available.
(c) Registered Companies only.
(d) Figures for end December 1933, are not yet available.

MALAYA RUBBER STATISTICS TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF MAY, 1934 IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
	Ports	Dealers	Estates of 100 acres and over	during the month	January to May inclusive 1934	during the month	January to May inclusive 1934	during the month: Foreign	during the month: From Malay States & Labuan	January to May inclusive 1934: Foreign	January to May inclusive 1934: From Malay States & Labuan	during the month: Foreign	during the month: Local	January to May inclusive 1934: Foreign	January to May inclusive 1934: Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States ...	...	14,254	8,742	11,658	57,006	12,116	54,404	Nil	Nil	Nil	Nil	20,703	21,256	83,130	48,840	...	976	3,807
Johore ...	...	3,694	2,879	3,850	18,374	6,499	25,828	Nil	62	Nil	78	2,341	13,445	8,911	40,658	...	222	976
Kedah ...	...	378	1,556	2,723	13,719	2,592	9,085	Nil	Nil	Nil	Nil	1,411	5,396	7,482	17,712	...	6	436
Perlis ...	...	27	20	21	72	25	172	Nil	Nil	Nil	Nil	Nil	89	Nil	283	...	Nil	4
Kelantan ...	...	389	164	231	1,120	903	4,311	Nil	Nil	319	Nil	118	1,508	487	5,620	...	Nil	61
Trengganu ...	...	55	50	368	1,233	183	614	Nil	Nil	Nil	Nil	Nil	551	Nil	1,847	...	55	50
Total Malay States	...	18,797	13,411	18,851	91,524	22,318	94,414	Nil	62	319	78	24,573	42,245	100,010	114,960	...	1,259	5,334
STRAITS SETTLEMENTS :-																		
Malacca ...	...	3,582	892	1,254	6,531			Nil		3		4,633		18,673		...	551	369
Province Wellesley	...	2,291	421	455	2,578			Nil		Nil						...	12	144
Dindings ...	...	77	103	108	528	3,576	14,158	Nil	37,140	Nil	103,737	8,529	Nil	24,609	Nil	...	1	22
Penang ...	1,777	7,002	4	14	58			2,604		10,729						4,719	14,281	3
Singapore ...	9,403	39,249	137	193	881			23,087		86,659		31,564		136,192		11,858	58,336	82
Total Straits Settlements	11,180	52,201	1,557	2,024	10,576	3,576	14,158	25,691	37,140	97,391	103,737	44,726	Nil	197,474	Nil	16,577	73,181	620
TOTAL MALAYA	11,180	70,998	14,968	20,875	102 100	25,894	108,572	25,691	37,202	97,710	103,815	69,299	42,245	297,484	114,960	16,577	74,440	5,954

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
20	21	22	23	24	25	26
DRY RUBBER	427	45,593	11,330	429	70	1
WET RUBBER	549	12,743	2,951	135	152	5
TOTAL ...	976	58,336	14,281	564	222	6

TABLE III
FOREIGN EXPORTS

PORTS	For month	January to May 1934
Singapore ...	46,780	194,058
Penang ...	12,934	66,176
Port Swettenham.	8,843	33,579
Malacca ...	742	3,671
MALAYA ...	69,299	297,484

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January to May 1934
Malay States ... / Straits Settlements	45,975	205,735
MALAYA ...	45,975	205,735

Notes:—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. *i.e.*, Column [9] = Columns [15] + [16] + [19] + [20] + [21] + [22] —[4]—[5]—[6]—[7]—[11]—[12]. For the Straits Settlements. Columns [9] and [10] represent purchases by dealers from local estates of less than 100 acres. reduced by 15 % to terms of dry rubber.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet. 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.

4 Domestic exports are estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign

METEOROLOGICAL SUMMARY, MALAYA, MAY, 1934.

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B.	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total.	Total.	Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.								
Railway Hill, Kuala Lumpur, Selangor ...	91.9	72.3	82.1	96	70	83	75	84.6	85.2	3.99	101.4	1.41	15	9	3	5		220.75	7.12	58
Bukit Jeram, Selangor ...	88.9	72.9	80.9	91	70	82	75	85.3	86.3	4.84	122.9	1.84	9	8	1	1	1	240.70	7.76	63
Sitiawan, Perak ...	90.5	72.5	81.5	93	69	86	75	84.4	84.9	3.17	80.5	0.76	13	8				225.00	7.26	59
Temerloh, Pahang ...	91.0	72.5	81.7	94	70	86	76	85.3	86.2	5.28	134.1	1.85	14	11		1		240.10	7.75	63
Kuala Lipis, Pahang ...	90.7	71.9	81.3	94	69	86	74	84.7	85.0	3.45	87.6	1.72	8	6	2	21	1	216.05	6.97	57
Kuala Pahang, Pahang ...	88.4	74.6	81.5	93	72	85	78	86.3	85.4	3.37	85.6	1.98	11	9	4			272.25	8.78	71
Mount Faber, Singapore ...	87.9	75.9	81.9	90	71	80	80	82.5	82.3	12.12	307.9	4.23	14	11	2		1	230.45	7.43	61
Butterworth, Province Wellesley ...	87.5	74.4	80.9	90	72	85	76	84.3	85.0	9.84	249.9	2.36	16	14	3		1	200.25	6.46	53
Bukit China, Malacca ...	85.5	74.3	79.9	87	71	81	77	84.6	84.8	7.43	188.7	2.08	16	14	3		1	229.05	7.39	61
Kluang, Johore ...	89.1	71.6	80.3	93	69	82	74	82.2	82.4	2.75	69.9	1.02	13	9		6		210.05	6.78	56
Bukit Lalang, Mersing, Johore	87.9	72.5	80.2	93	70	81	74	82.3	81.9	5.24	133.1	0.98	17	14	3	3		253.65	8.18	67
Alor Star, Kedah ...	87.8	75.0	81.4	91	73	84	76	86.3	85.8	9.45	240.0	3.56	21	16	4		1	230.30	7.43	61
Kota Bahru, Kelantan ...	90.5	73.8	82.1	93	71	81	76	84.8	84.6	6.88	174.8	2.14	17	14	7			241.10	7.78	63
Kuala Trengganu, Trengganu	88.6	73.6	81.1	91	71	82	76	83.8	84.7	4.18	106.2	0.98	15	13	7	1		230.10	7.42	60
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. Pahang ...	75.2	63.5	69.3	80	62	69	65	71.3	71.9	2.80	71.1	0.72	10	9	2	3	2	214.10	6.91	56
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	72.3	56.5	64.4	75	50	65	61	70.2	69.7	10.67	271.0	1.83	22	18	1		2	177.00	5.71	46
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	71.7	59.5	65.6	75	58	62	61			11.61	294.9	2.04	22	18			2	191.85	6.19	50

Compiled from Returns supplied by the Meteorological Branch, Malaya.

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THE

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EDITORIAL.

Bunch-Rot of Oil Palms.

The intensive cultivation of oil palms, such as obtains under plantation conditions, brings to light diseases and other affections which pass unnoticed—if indeed they occur at all—under conditions of natural growth, as in West Africa. This is not peculiar to the oil palm—it is common wherever large populations of a plant are grown.

In some cases, such diseases are endemic, while in other cases they are epidemic, the spread of the disease being due to the large number of trees of one kind in close proximity and to the advent of favourable conditions for such spread. Again, disease may become evident by reason of the lowering of the vitality of the plant through heavy fruiting.

It would seem that this latter is a contributory cause of fruit-bunch rot of oil palms. Mr. R. A. Altson, in an article on this subject included in the present number, finds that the disease affects the fruit-bunches of certain high-yielding strains of the oil palm. Evidence is brought forward to shew that the rot is caused by the saprophytic invasion of tissues whose resistance has been lowered by a nutritional disturbance. It is suggested that the nutritional disturbance is brought about by a soil deficiency; it is considered that this deficiency may be aggravated or induced by artificial pollination. The work, however, has not progressed sufficiently far to enable definite recommendations to be made regarding a manurial programme to make good such deficiencies.

The writer is able to recommend that artificial pollination should not be practised on high-yielding strains at least until they are found to be capable of bringing to maturity their full crops of naturally-pollinated bunches. Where the disease is found to be present it is doubtful whether anything is to be gained by removal and destruction of infected bunches; they should not, however, be sent to the factory as they will adversely affect the acidity of the palm oil.

Insect Pests of Stored Derris.

It is somewhat disconcerting to find that a plant such as derris (tuba root), which is grown and used entirely for its insecticidal properties, should itself be subject to the attacks of insects, both in the growing crop and as a stored product.

The increasing importance of derris and the wide recognition it is now receiving as an insecticide renders it desirable that precautions should be taken to ensure that it be marketed in as perfect condition as possible. Mr. N. C. E. Miller, in an article on "Control of Insect Pests of Stored Derris", which will be found on another page of this number, gives full instructions for the control of such pests. If his precautionary measures are adopted, the exporter may be assured that the consumer will receive the root in good condition.

A Special Bulletin of this Department is now in the Press, which gives a full account of the insects which attack stored derris and methods of control. Owing to the importance of this subject, it is considered that the present account, drawn from the Bulletin, will be welcomed by those engaged in the cultivation and export of derris root.

Disease of the Durian Tree.

Though the durian fruit may not find universal favour, the tree is the most valuable in the small holding. The fortunate possessor of a few durian trees derives considerable financial benefit from the sale of the fruit. The loss of but one tree in a holding therefore, may be a serious matter to the owner. They are very large trees and slow growing, so that any loss is not readily replaced.

Mr. A. Thompson's article on a "Disease of the Durian Tree" describes the recent investigation of a newly recorded disease capable of causing the death of durian trees. Increasing attention and care is taken by small-holders to ensure the health of their crops. Consequently, this contribution to our knowledge of a disease of the durian tree, with methods for its control, will be received by them with more attention than would have been the case a few years ago.

Original Articles.

FRUIT-ROT OR BUNCH-ROT OF THE OIL PALM

BY

R. A. ALTSON,

Acting Government Mycologist.

Introduction.

In August, 1933, an investigation was begun into the nature of a rot of fruit-bunches which was causing considerable losses in a large area of oil palms, not less than 40 per cent. of the crop from about 700 acres being affected. The palms were seven years old and had been raised from selected seed obtained from an estate in Sumatra. That this estate had successfully isolated a high-yielding strain was evident. The number of female inflorescences produced by the affected palms on the Malayan estate in the previous year had been, on an average per palm, more than double that produced in this country by the normal type of Deli palm at the same age and during the same period.

In February of this year a second outbreak of fruit-rot was reported from an estate eighty miles distant from the former area. The palms were seven to eight years old and had been grown from Sumatran seed. The precise origin of this seed was unknown, but it was on record that it had been obtained through A.V.R.O.S.* and had been guaranteed by them to be from high-yielding palms. In their abundant production of female inflorescences the affected palms resembled the palms previously observed, but the absence of suitable data prevented accurate estimates of productivity or of losses being made.

Artificial pollination had been in operation on the estate on which the first outbreak occurred for at least a year before the investigation was begun. On the other estate this practice was initiated only two months before the palms came under observation.

The conclusions which have been reached regarding the origin of fruit-rot suggest that it may make its appearance in certain areas which are shortly coming into bearing. For this reason it has been considered desirable to place on record an account of the disease and of these conclusions.

External Symptoms and their Relation to the Course of the Rot.

The fruit-bunch is the only part of the palm which is affected. Various forms of rot, involving anything from a few fruits to an entire bunch, may occur. Two forms of fruit-rot (base-rot and stigma-end-rot) and two forms of bunch-rot (bunch-end-rot and early bunch-rot) may be distinguished. These are characterised in the following manner.

Base-rot of the fruit. A brown water-soaked lesion appears on the base of the fruit. As this enlarges the fruit becomes detached, but, held in place by its bracts, often continues to rot *in situ.*

Stigma-end-rot of the fruit. Sunken areas appear on the apex of the fruit, the latter eventually becoming shrivelled and dry.

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* Algemeene Vereeniging van Rubberplanters ter Oostkust van Sumatra.

Bunch-end-rot. The distal end of a bunch decays and can be pulled out with ease, leaving a basal portion which is frequently unaffected and completes its development.

Early bunch-rot or bunch-rot. As a rule the whole bunch is involved and commonly decays during an early stage of development. Early bunch-rot often resembles and may be confused with the decay of unpollinated bunches.

In the majority of cases the rot originates in the apex of the spine, which is a prolongation of the side-branch on which the fruits are borne (fig. 1), and travels downwards in the direction of the main axis of the bunch (fig. 2). When it reaches the point of attachment of a fruit, the base of the fruit becomes involved and the condition known as base-rot of the fruit is established (fig. 3). It follows that in these circumstances, the apical fruit of a side-branch is normally the first to be attacked, and examination of a bunch exhibiting base-rot of the fruit will show that if only a few fruits on any side-branch are affected they are almost without exception the upper ones, and that if only one fruit happens to be concerned it is usually the apical one. Occasionally, the rot starts from the apex of a bract, and then it may be found that the only fruit affected is one in a median position (fig. 4). Fruits which have thus rotted at their base rapidly lose resistance and become liable to secondary infections at the base and at the apex. The secondary infection at the apex gives rise to the condition described as stigma-end-rot.

As the rate at which the rot in a side-branch advances will be dependent on the state of resistance of the tissues, and the extent of its advance on the length of time during which it has been operating, it follows that at any particular moment of observation the symptoms exhibited by different bunches may show a wide range of variation. If the rot sets in at an early stage in the development of a bunch, or if its advance is rapid, the whole length of the side-branch and all the fruits on it may be affected long before the bunch is ripe. Conversely, if the onset of the rot is delayed, or its progress is slow, the bunch may ripen with the loss of only a few apical fruits. Further modifications in the symptoms may arise from the fact that the number of side-branches affected in a bunch may range from one to many.

When, due to early onset or rapid progress, the rot has travelled down the entire length of a side-branch, it begins to involve the tissues of the main axis of the bunch. From this situation it can, by peripheral spread, affect the bases of other side-branches, so that what at first appear to be anomalous cases are frequently found where the rot is travelling in an opposite direction to that normally encountered (fig. 5). By horizontal extension of the peripheral infection, or by penetration into the internal tissues of the main axis, or by the coalescence of centres of rot originating from two or more affected side-branches, the apex of the bunch itself may be cut off from nutrient supplies, and then the condition known as bunch-end-rot arises (fig. 6).

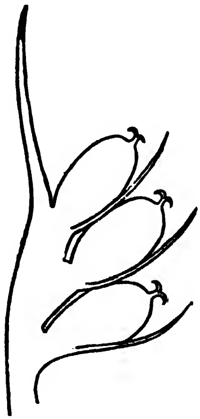

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Rotted tissue shewn in red.

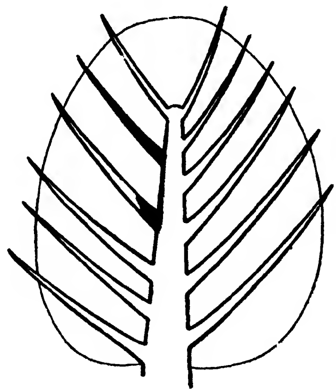

Fig. 5.

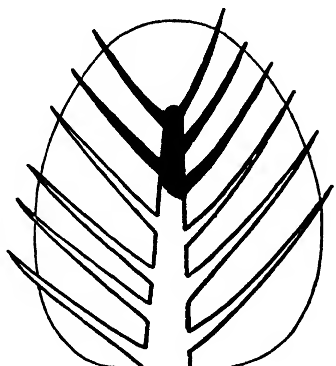

Fig. 6.

Rotted tissue shewn in red.

The condition known as bunch-rot, that is the state in which the entire bunch, or a very large proportion of the bunch is rotted, represents in some instances merely an extreme phase of the conditions already described, but in other cases it is apparent that some additional factor is operating. The conspicuous feature in these cases is the greater uniformity in the symptoms. The rot invariably sets in at a very early stage in the development of the bunch originating in a basal group of unpollinated side-branches situated on the right hand side of the bunch, and from there gradually extends into the main axis. Bunches thus affected always remain small. The fruits on the pollinated portion continue to develop so long as that part of the main axis, from which the side-branches bearing them arise, is not involved in the rot; but as a rule before their development has proceeded very far the entire main axis has decayed.

The additional factor to which reference has been made is therefore incomplete pollination. The constant occurrence of the unpollinated zone on the right hand side of the bunch seems to be due to the fact that the development of the female inflorescence is excentric in relation to the subtending leaf, the excentricity, in those cases which have come under observation, always tending towards the left, in such a manner that the right hand side of the inflorescence becomes shut in by the petiole, making it difficult for the pollen to gain access to the basal flowers.

Etiology of the Rot.

The decay of side-branches bearing unpollinated flowers is inevitable, but the spread of this decay to other parts of the bunch must be regarded in a different light, for experience shows that in normal circumstances its progress would be checked by the resistance of healthy developing tissue, and it is therefore to be supposed that it is only when this resistance is much impaired that the main axis and subsequently the entire bunch is liable to become involved. And, as in this type of rot, so in the types previously discussed, the rot of the fruits and of the bunches is considered to be due to an unchecked extension of natural decay, consequent on a loss of resistance in the affected tissues.

It has already been mentioned that the rot usually originates in the apex of the spine, and occasionally in the apex of the bract. Examination of normal bunches at all stages of development determines the fact that whilst the bulk of the tissue in these two appendages remains healthy, even up to the time the fruits are ripe, the first few millimetres of the apical tissue is always dry and decayed; and it is believed that the rot which spreads down the spine into the side-branch and thence to the main axis is merely the unchecked extension of this normal apical decay.

It will be appreciated that this explanation of the nature of the rot implies that it is due to the operations of saprophytic organisms, and is not a specific disease caused by a specific pathogen. The study of the organisms associated with the rot provides justification for this view.

Organisms Associated with the Rot.

Microscopical examination of tissue derived from the margin of the rot, in the spine, side-branches and main axis, has demonstrated that bacteria and nematodes are consistently present in this situation, the former in large numbers.

The constant occurrence of an organism in the margin or advance of a rot is evidence of its direct connection with the production of this condition. When at least two kinds of organism occur it will be agreed that either one invariably follows the other; that is, is secondary, or that both are equally concerned. If in this case the nematode were the primary organism; were in other words a parasite capable of advancing into healthy tissue, it should be found occurring in areas free from bacterial infection. But as such a state of affairs has not been observed it is to be assumed that this organism is a saprophyte.

To determine the rôle of the bacteria and the possibility of the presence of other organisms not observed in the sections, cultures were set up with tissue derived from the margin of the rot in various situations. From the thirty isolations thus made, five organisms were obtained in pure culture; a fungus and four species of bacteria. Study of the fungus isolation on various media has determined that it is a species of *Fusarium* belonging to the section *Martiella*. As a result of the examination of the morphology, tinctorial characteristics and physiological reactions of the bacterial isolations, these have been identified as:

1. A species of *Bacillus* belonging to the *B. mesentericus* group. This is a group of saprophytic organisms which includes forms occurring in the soil, in the intestines of herbivorous animals, and in decaying vegetable matter, and which is largely concerned in the breakdown of pectin and hemicelluloses.

2. A species of *Flavobacterium* resembling *F. diffusum*, a soil organism.

3 and 4. Two species of *Achromobacter* (a genus represented by forms found mostly in soil and water) which were readily distinguished from each other by certain physiological reactions.

The five organisms appeared in the orginal isolations in the following proportions:

Organism.	Percentage of cultures.
Flavobacterium sp.	40.
Achromobacter sp. (a).	40.
Bacillus (*mesentericus*).	30.
Fusarium sp.	12.
Achromobacter sp. (b).	10.

A species of *Gloeosporium* was isolated from the base of base-rotted fruits and from the apex of fruits exhibiting stigma-end-rot, but as this fungus was not once recovered from the margin of the rot, its presence in these situations must be held to be due to a secondary infection.

Pathogenicity of the Organisms.

In order to test the pathogenicity of the five organisms isolated from the margin of the rot they were inoculated in triplicate into the spines of developing bunches on oil palms at the Central Experiment Station, Serdang. Pure cultures were introduced into incisions made under aseptic conditions and each inoculated spine was subsequently bound with tape. A control inoculation was established for each of the five sets. Inoculated spines representative of each set were removed and examined at intervals of twenty days, five weeks, and two months after inoculation. The controls were removed at the same time as the last series of inoculated spines. Comparison of the inoculated spines with the controls showed that there was no significant difference in the amount of decay that had occurred, which in no case had advanced for more than a few millimetres into the tissue surrounding the incision. Furthermore, it was found that this decay had made no more progress in two months than it had made in twenty days. It may therefore be accepted that not one of the five organisms is capable of invading healthy oil palm tissue. They are saprophytes whose association with the occurrence of fruit-rot is to be interpreted as evidence that the resistance of the tissues of the affected bunches had been lowered prior to their attack.

Resistance and Nutrition.

The study of the organisms associated with the rot thus tends to confirm the opinion, derived from consideration of its course, that it is merely an abnormal extension of natural decay due to a loss of resistance in the affected tissues. If this view is correct, then it is of fundamental importance to determine the cause of this decline in resistance.

Resistance of this nature, that is, the normal resistance of functioning tissue to infection by saprophytic organisms, is a state whose existence is dependent on the vigour of the plant, or, more precisely, on the vigour of its protoplasm. The maintenance of this vigour is itself dependent on the maintenance of normal metabolism; so that a decline in resistance implies the existence of factors which are responsible for metabolic or nutritional disturbances.

Effect of a Nutritional Disturbance.

If the invasion of the bunch tissues by saprophytic organisms is dependent on a decline in resistance, which is itself consequent on a disturbance of normal metabolism, it follows that it should be possible to induce the rot artificially by a suitable nutritional disturbance.

It was to be supposed that such a disturbance would supervene if the nutrient supply which reaches the bunch by way of the peduncle were severely dislocated. To effect this dislocation it would only be necessary to kill a sufficiently large area of tissue in the peduncle. In order to accomplish this, a 0.5 per cent. aqueous solution of mercuric chloride was injected by means of a syringe into ½ inch holes drilled in the bases of the peduncles of three developing fruit

bunches. The use of mercuric chloride presented certain advantages. In the first place it is highly toxic to all living tissue and could be relied upon not only to kill all the cells with which it came into contact but to inhibit a rapid invasion of the wound by saprophytes. Furthermore, the fact that it tends to form insoluble compounds with protoplasm and simple proteins would prevent its translocation and thus localise its effect. At the time of treatment, two of the bunches were in an early stage of development, the third was almost fully formed. The fruits on all were black and unripe.

The bunches were first examined thirteen days after injection. The two youngest appeared unaffected. The third bunch had begun to change colour and several fruits borne at the apices of the side-branches were loose or had fallen and were found to be rotted at the base. This bunch was removed from the palm and dissected seven days later. Its condition was typical of that exhibited by bunches affected with base-rot of the fruit. Most of the apical fruits of the side-branches had rotted and fallen, although the bunch was not yet fully ripe. Examination of the course of the rot showed that it had originated in the apex of the spine and travelled downwards, involving the bases of the fruits in its path. Some decay had set in at the base of the peduncle, where it had been wounded and injected, but a large expanse of healthy tissue separated this from the decay in the side-branches, leaving no doubt that the latter had been induced, not directly, but indirectly by the disturbance at the base of the peduncle.

The two bunches which had been injected when immature were kept under observation for two months without any development of fruit-rot being observed. As the peduncles were themselves in an active state of growth at the time of treatment it was considered that the effect of the injections had possibly been neutralised by the elaboration of compensating vascular tissue. Each bunch was therefore injected for a second time. Cases of base-rot of the fruit were observed nine days later on both bunches, which were still black and unripe. One bunch was removed and dissected. The rot was found to have progressed in the typical manner, that is, down the spine, or bract, and thence into the base of the fruit. The disintegration of the peduncular tissue resulting from the injections was definitely localised and separated from the rot in the spines by an extent of healthy tissue covering the entire length of the bunch.

The experiment showed, therefore, that typical fruit-rot may be induced by dislocation of the nutrient supply and confirms the opinion that palms so affected have been predisposed to the attacks of saprophytic organisms by a nutritional disturbance.

Cause of the Nutritional Disturbance.

A nutritional disturbance of this kind, which is not due to infection of the tissues by a parasitic organism, must be the outcome of some adverse environmental condition. The normal type of Deli palm can be grown on Malayan soils without being subject to severe outbreaks of fruit-rot, although isolated cases of base-rot and of bunch-end-rot are occasionally encountered. Both the outbreaks of fruit-rot which have been investigated occurred on palms

which were representatives of high-yielding strains. So whatever may be the nature of the adverse environmental factor, it would appear to become operative only when high-yielding strains are cultivated. Such a correlation suggests that the predisposing nutritional disturbance is the result of a soil deficiency.

If this interpretation is correct, then the incidence of the rot will be influenced by artificial pollination, providing that this practice tends to increase the number of developing fruits. When the soil is already deficient the effect of artificial pollination will be to aggravate the shortage and intensify the outbreak. If, however, the deficiency is merely potential, artificial pollination may then become the factor which induces the deficiency and the disease.

The proof of these hypotheses is a matter for experiment. Suitable experiments are in progress.

Recommendations.

Artificial Pollination.—Until there is evidence that, under any particular Malayan conditions, certain high-yielding strains of palms are capable of bringing to maturity their full crops of naturally-pollinated bunches, artificial pollination should not be practised. But if such conditions appears to exist and it is proposed to initiate a programme of artificial pollination, it must be borne in mind that this practice may itself induce fruit-rot.

Manurial Treatment.—If fruit-rot is primarily a deficiency disease then it is clear that some form of manurial treatment is called for. But it is not possible in the present state of knowlege to make any specific recommendation.

Removal of Rotting Bunches.—The extent of the benefit to be derived from the removal and burial of rotting bunches is open to question. Were the operation performed early enough, a useless translocation of nutrients would be prevented. But it is doubtful whether such treatment would do much to reduce the prevalence of the associated saprophytes, in view of their normal abundance.

Rotten Fruit and the Factory.—Rotten fruit must be regarded as a total loss and should not be permitted to enter the factory, otherwise the acidity of the oil will be increased.

Summary.

1. A rot affecting the fruit-bunches of certain high-yielding strains of the oil palm has recently become prominent.
2. The rot may assume various forms. Four main types are distinguished. These are shown to have a common origin.
3. Study of the organisms associated with the rot, and of its course within the bunch, has led to the conclusion that it is caused by a saprophytic invasion of tissues which have been predisposed to attack by a decline in resistance.
4. This decline in resistance is held to be due to a nutritional disturbance.
5. A typical form of the rot has been induced by an artificial dislocation of the nutrient supply.
6. It is suggested that the predisposing nutritional disturbance is brought about by a soil deficiency, and it is considered that this deficiency may be either aggravated or induced by artificial pollination.

CONTROL OF INSECT PESTS IN STORED *DERRIS*

BY

N. C. E. MILLER,
Assistant Entomologist.

In Malaya, dried *Derris* root is liable to damage by several species of beetles,* in both the larval and adult stages. The adult beetles will attack the root a few days after harvesting, but it is more attractive to them after a longer period when the moisture content is low.

The adult beetles lay their eggs in cracks and irregularities on the outside of the root, and the larvae on hatching, bore into the internal tissues and gradually reduce them to powder. On attaining the adult stage (the period from egg to adult being approximately nine weeks) the beetles remain in the root for a short time, then bore a way out and fly off.

Infestation, unfortunately, is not always apparent, since it is only the adults which eject frass from their tunnels; thus it is necessary to take samples of root and split them to be able to ascertain whether larvae or adults of the beetles are present.

Frequently, however, beetles which have laid their eggs on root, also bore into it and in doing so, betray their presence both by the holes they gnaw and also by the frass which they scatter from the tunnels. The presence of frass is generally an indication that the damage is extensive, and that immediate steps must be taken, if complete destruction of the root is to be arrested.

Unless the store is provided with windows covered with wire gauze of 1 mm. mesh, and with doors that fit perfectly so as to leave no crevices through which adult beetles may gain entrance, the protection of *Derris* root against infestation by beetles is almost impossible, in view of the fact that it is a common practice to accumulate stocks of root until the quantity is sufficient to justify export.

It is highly important that the store be kept clear of odd pieces of root, remaining after the packing of former consignments, since such pieces provide material in which the beetles can breed and eventually spread to fresh stocks.

The question of re-infestation of *Derris* in transit on board ship is a difficult one, but if roots are carefully graded and all portions of more than about half an inch in diameter are rejected, the danger of infestation will be greatly minimised. It may be mentioned that such roots so rejected have little toxic value.

Complete elimination from infestation can be secured if the root is ground to powder and packed in sealed tins, but for this purpose a special type of mill is essential, since, during grinding, the cogs of the wheels are inclined to become clogged and need frequent cleaning.

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* *Sinoxylon anale* Lesne., *Xylopsocus capucinus* F., *Dinoderus minutus* F. (these are the most important) *Sinoxylon rugicauda* Lesne., *Sinoxylon malaccanum* Lesne., *Dinoderus bifoveolatus* Woll., *Xylothrips flavipes* Illig., *Perissus laetus* Lameere, *Pterolophia melanura* Pasc., *Minthea rugicollis* F., *Hypothenemus eruditus* Westw. and *Alphitobius laevigatus* F. These species have been fully dealt with in the "Coleopterous Pests of Stored *Derris*", Dept. Agric. Scien. Ser. No. 14, 1934.

Another method which has been found effective in preventing infestation is to cut the dried root into pieces of about 2 inches in length which are then packed in a plywood chest of the kind used for the export of tea or rubber.

A chest measuring 19 x 19 x 24 inches will hold about 100 lbs. of dried root. This method of dealing with *Derris* root has been practised with satisfactory results by one local firm.

Root treated in this manner should be dried, either in the sun or in a hot-air dryer, chopped and packed expeditiously, and if any root is left over, this also should be packed temporarily, to protect it from infestation until an opportunity occurs to include it in a further consignment.

If on examination of a stock of root, it is found that beetle borers are present, and that the damage is not so far advanced as to render the root worthless, the following methods for the destruction of the beetles and their larvae are recommended.

One method which has been found effective, in killing larvae, pupae, and adults, is to remove the root from the store and expose it for about 5 hours to bright sunshine. More rapid results will be obtained if the root can be spread on iron sheeting, or on a cement floor. Since this method is both cheap and effective, its occasional adoption, especially if no store is available in which stocks can be adequately protected, will possibly obviate considerable monetary loss.

During periods of wet weather, or when the sky is overcast, and consequently there is insufficient sunlight to be effective, it will be necessary to fumigate the root. For this purpose, an air-tight fumigatorium, or a room which is sufficiently air-tight to ensure the minimum escape of vapour, is essential.

The chemical recommended for fumigation is carbon bisulphide, a somewhat expensive substance, but it has satisfactory penetrating qualities and is not difficult to handle.

It should be emphasised, however, that great care must be taken not to inhale it, and also to keep it away from fire since it volatilises rapidly on exposure to the air and forms a vapour which is highly inflammable and explosive when mixed with a certain proportion of air. Another property of carbon bisulphide is that it is heavier than air. It should, therefore, be applied at the top of a pile of root, preferably being sprayed on cloth or sacking.

The quantity recommended for use in fumigation is 2 to 3 pounds per 1000 cubic feet, the amount depending, to some extent, on the amount of root to be fumigated and the degree to which air can be excluded from the chamber.

Fumigation with carbon bisulphide, to be effective, should be extended over a period of 72 hours.

Subjecting infested root to heat, without scorching, for three days is also a satisfactory method of destroying beetle borers, and if a crop of *Derris* is being grown on a rubber plantation, it will be found convenient to use the smoke-house for this purpose.

A DISEASE OF THE DURIAN TREE

BY

A. THOMPSON,

Government Mycologist.

Introduction.

The durian tree (*Durio zibethinus*) which is indigenous to the Malay Peninsula and Netherlands India is looked upon as one of the most valuable and desirable trees in the somewhat mixed collection of fruit trees grown in the Malay small holdings, since the fruit, which has a unique flavour, is always readily saleable in the local markets and in addition, is valued for its tonic food value.

There are no former records of any serious diseases of the durian tree in Malaya, probably due to the fact that the cultivation of the tree is confined mainly to the small holdings from which deaths are not readily reported.

Recently, however, a disease which has been identified as claret-coloured bark canker (or patch canker), has appeared on an estate in Penang where there is a comparatively large area devoted to the cultivation of this fruit.

The Disease.

The disease resembles claret-coloured bark canker of the rubber tree in that there is, at first, no external indication of the presence of a fungus in the tissues of the bark until a dark liquid begins to exude from one or more spots on the trunk, sometimes near or at the collar. Boring beetles soon attack the bark at these spots and bore into the stem. Healthy cortical tissue of the durian tree is pinkish in colour but, when it is attacked by the disease, areas of a darker, dull-red colour, bounded by an irregular margin, are formed and these extend in as far as the wood of the stem.

The disease was reported in May 1934, and has not yet been studied in detail, but from information received from the grower of the affected trees, it appears probable that the disease does not kill a tree quickly, but that the canker spots in the bark gradually increase in size and may coalesce until a considerable portion of the bark is killed and becomes riddled with boring beetles. Finally, the branches die back owing to dislocation of the food supplies and the tree dies. A tree may not die until more than a year after infection has occurred.

The disease appears to have been present in this locality during the past ten years and has annually killed a number of trees. In the area examined, a fair number of trees were found to be infected.

The Cause of the Disease.

The fungus *Phytophthora palmivora* Butl. was isolated from the cortex of a diseased tree and when inoculated into a healthy tree, reproduced the

first symptoms of the disease within seven days. The fungus was again isolated from the inoculated bark, thus establishing that this fungus is the cause of the disease.

The fungus has already been recorded as a cause of a similar disease of the rubber tree; other species of the same genus and a species of Pythium (*P. complectens*), have been found to attack rubber trees in Malaya.*

Pythium complectens has recently been observed to attack the collar of rubber trees which have been affected by lightning†, but in the case of the disease of the durian tree there was no indication of lightning injury and the fungus *Phytophthora palmivora* is undoubtedly a primary parasite, capable of directly attacking this tree.

Phytophthora spp. are only virulent in wet or damp weather, since they only produce the active motile spores—known as zoospores—in the presence of water. These zoospores are the principal agents in the spread of infection. During dry weather, the mycelium of the fungus in the bark of affected trees may cease to extend in the tissues and if dry weather continues for a prolonged period, the diseased bark may scale off, leaving a canker on the stem.

It is probable that rapid extension of the disease in the cortex occurs mainly during wet weather and that, during intervening spells of dry weather, the growth of the mycelium is slight, so that the disease does not kill a tree quickly under normal weather conditions. When the disease is situated at the collar, or if it extends to the collar, the probability of its more rapid extension is greater owing to the moister environment at soil level.

The Importance of the Disease.

The presence of an infectious and fatal disease in a perennial crop is a matter for concern, particularly in the case of valuable trees which take some years to reach maturity.

Phytophthora palmivora is, furthermore, likely to spread from a diseased tree to other economic crops in the vicinity. A strain of the fungus is the cause of coconut bud-rot in India and certain other countries, but, so far, this disease has not been recorded on the coconut palm in Malaya. Black stripe and patch canker are, however, two diseases which may appear in rubber trees growing near infected durian trees, and it is also probable that durian trees may become infected if these diseases are present in neighbouring rubber trees.

Treatment of the Disease.

The only feasible method of treating this disease is excision of the diseased bark. It is recommended that the bark should be scraped until the extent of the diseased patch is determined. The affected bark should then be isolated by cuts extending to the wood; the diseased bark should be removed and burnt

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* Thompson, A. Phytophthora species in Malaya. *Malayan Agricultural Journal,* 17: 53—100. 1929.

† Sharples, A. Lightning Storms and their Significance in Relation to Diseases of (1) Cocos nucifera and (2) Hevea brasiliensis. Ann. Appl. Biol. 20: 1—22. 1933.

and the wound painted with a weak solution of a disinfectant such as 2 per cent. Izal, finally covered with tar, or with a mixture of melted asphalt (60 parts) and kerosene oil, or solar oil (40 parts).

Treatment is difficult if the disease is in an advanced stage; consequently, growers are advised to inspect the trees periodically, particularly if any of the durian trees in the neighbourhood have died from a disease showing the symptoms described above.

Summary.

1. A disease of the durian tree is described.
2. The disease, which is similar to the disease of rubber trees known as claret-coloured bark canker or patch canker, is caused by the fungus *Phytophthora palmivora.*
3. It is considered that the fungus is likely to spread to rubber trees from adjoining, diseased durian trees and *vice-versa.*
4. Recommendations for treating the disease are given.

CONDITIONS ON SMALL RUBBER HOLDINGS IN MALAYA

2nd Quarter, 1934.

Prepared by the Economic Branch of the Department of Agriculture, S.S. and F.M.S. in collaboration with the Field Branch of the Department.

Rainfall.

In Kedah April was wet. In early May also the rainfall was considerable, but that of June was below average. In the Northern Circle of Johore, April and May were generally dry, except for some very heavy showers. During June although the rainfall was low it was more evenly distributed. In the Southern Circle, April and May were wet months while in June drier conditions prevailed in most districts. At Mersing the rainfall throughout the quarter was sparse. In Selangor, April was wet, but May normal. In June the weather was wet in the inland districts and dry on the Coast. In Perak, the total rainfall was heavier than usual, except on the coastal flat land in Lower Perak. In April and June the rainfall was heavier than usual whilst in May it was generally below the average for the month.

Prices.

The report of an international agreement for the restriction of rubber production and the announcement that it would be brought into force on 1st June, resulted in a quick rise in the price of the commodity. As will be seen from the accompanying Table I, there was in most States a considerable difference between the highest and lowest prices paid in April and May, due partly to rising prices and also, no doubt, to a certain amount of speculation on the part of buyers. Prices varied within narrower limits in June when the situation became clearer and the Singapore price appeared more stable.

The average Singapore prices of standard smoked sheet in cents per lb. were as follows:—April 18.75, May 21.35, June 21.82, while the Singapore prices at the end of each month in dollars (Straits) per picul (133⅓ lbs.) for small-holders' rubber were as follows: April: smoked sheet $25.50, unsmoked sheet $23.50, scrap $9.50. May: smoked sheet $16 to $24, unsmoked sheet $12 to $31.50, scrap $2.50 to $16. June: smoked sheet $26, unsmoked sheet $22—$23.50, scrap $11.

It will be noticed that with the advent of restriction, scrap rubber became unsaleable in almost every district, the issue of coupons in most cases being sufficient to cover only the production of sheet.

Most small dealers preferred to purchase wet rubber, as, being covered by coupons, it enabled them to accumulate coupons in excess of the dry rubber held by them. It is suggested that many dealers at port have thus obtained coupons in excess of rubber held by them to the extent of 8 per cent.

Table I.
Lowest and Highest Rubber Prices Paid by Local Rubber Dealers.
(In Straits dollars per picul (133 1/3 lbs.))

2nd Quarter 1934.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
			APRIL					
Smoked sheet	21.00-25.50	19.70-25.00	20.00-26.00	19.50-25.15	18.00-30.00	23.00-30.00	20.00-28.00	19.00-24.00
Unsmoked sheet	20.50-24.50	17.00-24.00	17.00-24.00	17.20-23.00	14.00-23.20	20.00-28.00	17.00-24.00	16.00-28.50*
Scrap	5.00-11.00	5.00-11.00	6.00-11.00	4.00-11.00	4 00-11.50	5.00-14.00	8.00-15.00	3.00-10.00
			MAY					
Smoket sheet	23.00-32.00	18.00-31.50	20.00-31.00	13.00-32.35	13.50-31.70	18.00-32.00	21.00-28.00	20.00-33.00
Unsmoked sheet	20.00-31.50	14.50-28.00	19.00-28.00	12.00-31.00	11.00-29.00	18.00-26.00	18.00-25.00	16.00-29.00
Scrap	4.00-15.00	4.00-14.75	4.00-16.00	3.00-14.00	3.00-15.00	4.00-16.00	8.00-14.00	2.00-12.00
			JUNE					
Smoked sheet	24.00-25.00	21.00-26.50	22.00-27.40	22.50-27.00	18.00-27.00	24.00-26.00	22.00-26.50	20.00-26.50
Unsmoked sheet	22.00-24.00	20.00-25.50	20.00-24.00	20.00-25.00	16.00-25.00	22.00-25.00	18.00-24.00	15.00-25.00
Scrap	10.00-15.00	Unsaleable	4.00-7.00	Unsaleable	Unsaleable	Unsaleable	10.00-15.00	3.00-8.50

*$28.50 in one centre only. The average highest price was about $22.00

Table II.

Mean of Lowest and Highest Rubber Prices Paid by Local Dealers.

(In Straits dollars per picul (133 1/3 lbs.))

2nd Quarter 1934.

	Penang	Perak Av. 17 centres	Selangor Av. 7 centres	Negri Sembilan Av. 6 centres	Pahang Av. 6 centres	Malacca Av. 3 centres	Kedah Av. 4 centres	Johore Av. 12 centres
				APRIL				
Smoked sheet	22.25-24.75	20.95-24.01	22.25-24.48	21.30-24.33	20.32-24.85	24.00-27.00	21.75-24.70	20.96-23.05
Unsmoked sheet	21.60-23.80	18.32-20.62	19.62-21.05	19.75-22.01	17.30-21.96	21.33-25.00	18.75-21.25	19.96-22.36
Scrap	8.20-10.30	6.39-7.96	6.83-8.43	5.16-8.83	6.42-8.65	6.33-11.66	9.25-11.37	5.83-8.36
				MAY				
Smoked sheet	24.12-30.25	20.17-26.32	21.30-30.08	19.75-29.94	19.16-30.03	21.00-27.66	24.12-25.75	21.80-27.99
Unsmoked sheet	23.40-28.90	16.13-21.40	20.83-26.00	13.60-25.40	15.80-27.12	19.33-25.66	21.25-25.50	18.87-24.38
Scrap	7.60-13.60	5.00-7.93	6.00-10.50	3.60-9.90	5.42-11.75	5.66-9.33	8.50-10.87	5.83-8.27
				JUNE				
Smoked sheet	23.62-25.00	22.67-25.18	24.22-26.32	23.00-25.70	21.67-25.32	24.33-26.00	23.50-25.62	22.55-24.69
Unsmoked sheet	22.10-23.70	20.23-22.77	20.66-23.33	21.10-23.83	19.80-23.30	22.66-24.33	20.50-23.37	19.92-22.73
Scrap	11.50-14.00	2.00§-3.50§	5.00‡-3.50‡	Unsaleable	Unsaleable	Unsaleable	10.00*-13.75*	6.16†-8.00†

*Quotations at 2 centres only.
‡Quotations at 2 centres only.
†Quotations at 3 centres only.
§Quotations at 3 centres only. Unsaleable elsewhere.

Table I shews the lowest and highest prices at which rubber was purchased by dealers in each State. Such figures are apt to be misleading, as the highest or lowest price may refer to but isolated purchases. Table II, which shews the mean of lowest and highest prices paid, is a more certain indication of the range of prices which obtained during the period under review.

A trade has already started in the sale of coupons. It was reported from Selangor, for instance, that small-holders sold their coupons without rubber to dealers at $11 to $12 per picul, and rubber without coupons at a price of $10 to $12 per picul, where the price offered for rubber with coupons was $27 per picul.

Tapping.

In many parts of the country during the period of rising prices and in anticipation of the introduction of restriction, tapping was severe on small holdings, the owners wishing to take advantage of the more favourable prices ruling. The period following the announcement of restriction and prior to it coming into operation, was one of some uncertainty and there was, therefore, some easing-off of the severity of tapping. From the beginning of June there was some decline in the area tapped and an improvement in the tapping generally, as the owners realised that they were able to obtain sufficient rubber to cover their coupon issue without recourse to drastic systems of tapping. It is reported from Kedah that heavy rains interfered with tapping at one period, but that afterwards heavy tapping was general. Johore reports that the high price of rubber resulted in the production of rubber from many tappable trees which had previously never been tapped.

Areas out of Tapping.

The method of estimating the area untapped on small holdings by means of counting the number of such holdings along the sides of main roads, and applying the percentage thus obtained to the total area of small holdings in the area, was repeated in June. It should be remarked that this method, while not claiming great accuracy, provides a useful index figure of the variations of the amount of tapping on such holdings.

The results of the present survey are stated in Table III, from which it will be seen that in all States covered by the survey, there was a tendency to reduce the area tapped.

The total area of tappable rubber on estates of less than 100 acres which was untapped in the Federated Malay States at the end of June, 1934, is estimated on the foregoing system to amount to about 54,600 acres, as compared with 34,950 acres at the end of March. The total area untapped in the Straits Settlements at the end of June was 18,800 acres as compared with 9,900 acres at the end of March.

Table III.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres, at the end of June, 1934.

PERAK

District	Total Tappable area	Total area untapped	Percentage
Batang Padang	37,288	1,500	4
Kinta	34,180	1,400	4
Kuala Kangsar	43,485	5,200	12
Upper Perak	13,774	1,500	11
Larut & Selama	51,407	3,600	7
Krian	9,751	5,600	58
Lower Perak	47,937	4,800	10†
	237,822	23,600	10

SELANGOR

District	Total Tappable area	Total area untapped	Percentage
Klang	18,879	2,100	11
Kuala Langat	29,263	1,200	4
Ulu Langat	38,867	1,900	5
Ulu Selangor	30,632	1,800	6
Kuala Lumpur	21,174	4,000	13
Kuala Selangor	9,379		
	148,194	11,000	10

NEGRI SEMBILAN

District	Total Tappable area	Total area untapped	Percentage
Seremban	19.241	1,900	10
Tampin	17,947	3,200	18
Kuala Pilah	17,470	3,800	22
Jelebu	6,270	800	13
Port Dickson	10,653	1,100	10
	71,581	10,800	15

PAHANG

District	Total Tappable area	Total area untapped	Percentage
Raub	7,361	1,000	13
Kuala Lipis	15,951	300	2
Bentong	13 600	4,000	31
Other Districts	31,223	4,500	14†
	68,135	9.800	14

MALACCA

District	Total Tappable area	Total area untapped	Percentage
Central	17,687	500	3
Alor Gajah	31,387	6,000	19
Jasin	24,971	4,000	16
	74,045	10,000	14

PENANG & P. WELLESLEY

District	Total Tappable area	Total area untapped	Percentage
North	3,241	300	10
Central	7,067	1,300	19
South	8,149	—	—
Dindings	7,279	4,900	68
Penang	11,114	800	7
	36,850	7,300	20

SINGAPORE

District	Total Tappable area	Total area untapped	Percentage
Singapore	12,781	1,000	8
	12,781	1,000	8

The percentage of areas out of tapping in March, 1934, was as follows:—Perak 7, Selangor 5, the Negri Sembilan 8, Pahang 9, Malacca 9, Penang and Province Wellesley 5, Singapore 8.

† Estimated from mean percentage for remainder of State.

Condition of Holdings.

There was a very marked improvement in the condition of small holdings in all States. Clearing of undergrowth and the general cleaning up of holdings was general. It is stated that this was not due only to the improved financial position of the owners, but in many cases to the belief that a reduction will be made in coupon issue under the rubber regulation scheme in the case of holdings that are overgrown.

No serious cases of soil erosion have been reported during the quarter.

Diseases.

In Kedah, bark diseases became evident in old infected holdings with the advent of wet weather and the usual methods were adopted for their control. The distribution of a fungicide by the Department was continued in three Districts.

Johore reports state that the dry spell experienced during the first two months of the quarter was instrumental in effecting an improvement in the condition obtaining in the badly-infected area in the Northern Circle. The easing of the economic position of the small-holder, coupled with the advent of rubber regulation, led to an increased use of disinfectants in most areas. The fear that the assessment rate for small holdings will depend to some extent on the absence of disease, led many small-holders to take more energetic measures to check mouldy rot disease in their holdings. The outbreak of oidium disease in several districts reported during the previous quarter, diminished in intensity early in the present quarter and infected areas rapidly recovered. Several cases of pink disease were found in the Kluang District; treatment and control measures were undertaken early and the attack was confined to a few trees only. Only a few cases of root disease were reported and these were effectively controlled.

Mouldy rot disease was well under control in most areas in Selangor. In Perak this remains the only disease of any importance. Increased control measures were taken by the owners, greater use being taken of the facilities provided by the Department for the supply of approved fungicides for its treatment. No reports of *oidium heveae* were reported.

Grades of Rubber.

Considerable variations of importance have been noted in the grades of rubber purchased by dealers as is shewn by the following figures.

Kedah.—The percentage amount of smoked sheet declined in all districts by about 20 per cent., while unsmoked sheet increased to a similar extent. In Alor Star the average percentages were:—smoked sheet 70, unsmoked sheet 16, scrap 14; Sungei Patani—smoked sheet 34, unsmoked 57, scrap 9; Baling—smoked 23, unsmoked 66, scrap 11; Kulim—smoked 29, unsmoked 32, scrap 39 (scrap decreased, while smoked shewed an increase during the quarter).

Johore.—The percentage of the different grades of rubber sold, varied enormously as between Districts. In Batu Pahat and Benut over 70 per cent. was smoked sheet, most of the remainder being unsmoked sheet; in Tangkak, Muar, Segamat, Kluang, Senggarang and Johore Bahru the average was: smoked 46, unsmoked 45, scrap 9; while at Panchor, Pontian and Kota Tinggi purchases were almost entirely of unsmoked sheet.

Selangor.—Smoked sheets were still being prepared in the Coastal Districts, while in the inland Districts both smoked and unsmoked were prepared. Improvement in quality of smoked sheet was reported in one District.

Perak.—In Perak North, only in Taiping was any considerable amount of smoked sheet purchased (37 per cent.). In 7 other centres the purchases averaged 72 per cent. unsmoked and 18 per cent. scrap. In Perak South, with the exception of Tanjong Malim (74 smoked, 16 unsmoked, 10 scrap) the percentage purchases at 3 centres were: smoked 18, unsmoked 70, scrap 12. In the Krian District percentage purchases were smoked 10, unsmoked 60, scrap and lump 30: Selama sub-District smoked 80, unsmoked 20. In Kuala Kangsar the percentages were smoked 41, unsmoked 21, scrap 38.

It will be noted that the above figures do not reflect the cessation of purchase of scrap and very low-grade rubber which was a feature of the June market.

General.

No cases of budding of rubber or of new planting have been brought to notice during the quarter. Furthermore, owing to the more favourable price of rubber, there was no evidence of abandonment of rubber holdings in favour of other forms of cultivation.

The position of the small-holder has considerably improved, but the full effects of the improvement will not be apparent until next quarter when his debts to Government for land rent will have been liquidated and the increased cash return from the sale of rubber can be devoted to his own needs.

The quality of rubber marketed tends to improve, not only on account of the lack of demand for scrap but by reason of a growing appreciation of the fact that higher grades command higher prices. It is reported, for instance, that the import of rubber-mangles has increased in Kelantan where they are purchased by the small-holders or hired for the purpose of preparing a better grade product.

Miscellaneous Article.

MALAYAN GRADED PINEAPPLES.

A commercial consignment of pineapples graded in accordance with the provisional grading standards drawn up by the Department of Agriculture, S.S. and F.M.S., was packed at a canning factory in Singapore during February 1934. The consignment consisted of 87 cases, comprising 25 cases of Golden Cubes, 25 cases of G.A.Q. Cubes, 25 cases of Golden Slices (spiral cut) and 12 cases G.A.Q. Slices (spiral cut). Fruit was dear and scarce at the time of packing. The consignment was inspected by the Agricultural Field Officer, Singapore, before despatch and passed as conforming with the grading standards. It was despatched to the Agent, Malayan Information Agency, early in March 1934. All cases and tins were clearly marked to show their grade and the consignment was accompanied by a grading certificate.

It should be emphasised that the consignment was packed by the factory and was only inspected by the Agricultural Field Officer, Singapore, to ensure that it conformed with the grading standards. The standards achieved, therefore, should be capable of attainment in any factory, provided that a supply of fruit of average size and ripeness is obtainable. The consignment thus represented a definite practical commercial experiment, although it was considered to represent the upward limit of the respective grades.

The Agent, Malayan Information Agency, was requested to bring this consignment to the notice of the trade and to effect a sale thereof on behalf of the Department of Agriculture.

The cost of the consignment was—

87 cases at \$3.67	...	\$319.29
Freight and Shipping Charges	...	94.74
		\$414.03

The consignment was sold at an all round rate of 2s. 9d. per dozen tins or 11s. per case, delivery and labelling at buyers' charge. The market price of the day was 2s. 10d. per dozen, labelled and delivered. The price of 2s. 9d. was considered to be equivalent to 3s. 1d. labelled and delivered, so that it represented 3d. more than the price of the day, a margin stated by the trade to be considerable.

Th actual sum realised for the sale of this consignment was:

87 cases at 11s. = 957s., equivalent to \$410.14.

The average sale price per case, after deducting shipping and handling charges was \$3.62. In considering the price realised, allowance must be made for the fact that the consignment was small, so that the grading charges were pro-

portionately higher than those on a large consignment and that the price obtained was an average for all grades.

In connexion with the sale of the consignment, the Agent, Malayan Information Agency, writes —

> " There is no 'market' for pines in the sense that there is for many commodities. By this I mean that there is no central place where pineapples are examined and then bid for in the same way, *e.g.* as there is for wool.
>
> " All pineapples are sold by private treaty between the merchant and either the broker or the distributor and it is therefore impossible to obtain competitive bids for a small consignment from people with a long established connexion either with a particular canner or a particular shipper."

He further points out that in practice, the labelling is haphazard and unsystematically done so that the ultimate purchaser has, in very many cases, no idea that there are different qualities. The result is that there is only a very slight difference between the prices of different grades and the premium on the better quality is almost negligible.

In order to arrive at the opinion of the trade on the quality of this consignment, the Agent invited 25 merchants, dealers and distributors to inspect samples and to write their opinion for his confidential information. Moreover, Mr. Banner, Mr. Graham and himself, all being officers of the Agency, made detailed inspections of two sets of samples.

In sampling the consignment, the Agent noticed that there was a very large sedimentary deposit when the syrup was allowed to stand for a few minutes in a glass. Consequently, the syrup was analysed with the following satisfactory result —

" (1)	Golden Slices	Sugar 16.91	per cent.
(2)	Golden Cubes	16.42	do.
(3)	G.A.Q. Slices	16.43	do.
(4)	G.A.Q. Cubes	16.94	do.

> " The above figures are for total sugars expressed as sucrose in the syrup.
>
> " The sediment is essentially similar in each can and consists of vegetable tissue from the fruit, together with a number of crystals or raphides of crystallised calcium oxalate. The formation of such crystals is fairly common in pineapple products. The sediment is quite free from metals."

The results of the detailed inspection of the two sets of samples by the officers of the Agency may be summarised as follows. Details are given in the Appendix.

G.A.Q. Cubes.	Sample 1.	"Below G.A.Q. average".
	Sample 2.	"Cubes uniform in size, fair colour, can be classified as good".
G.A.Q. Slices.	Sample 1.	"Taking all together is an improvement on present G.A.Q.".
	Sample 2.	"Fair sample of G.A.Q.".
Golden Cubes.	Sample 1.	"Up to standard of average Golden but not superior".
	Sample 2.	"As a whole under colour, fruit firm and uniform".
Golden Slices.		"Fair Golden".

The examination revealed considerable differences in the contents of the different tins.

There was considerable variation in the opinions expressed by the representatives of the trade as a result of their examination of the samples. The following extracts illustrate this —

(*a*) "The GOLDEN quality were perfect of their kind and if it could be arranged that all shipments of the G.A.Q. quality Cubes were up to the standard submitted, there could not be any cause for complaint by either the trade or the consumer. We feel sure that if this standard could be maintained and guaranteed, the article would command higher prices than have ruled for some considerable time.

"The G.A.Q. Slices were inferior to the standard required and such quality would do harm to the trade."

(*b*) "We would suggest that if you ship only Golden quality and G.A.Q. quality equal to the samples which we inspected the business would be put on a very much firmer basis."

(*c*) "I criticised the quality of the G.A.Q. and made them below current standards. Those since inspected at my request by....... apparently turned out better."

(*d*) "1½ *Tall Golden Slices.* The sample tins which I saw at your office were in my opinion, a very good delivery for this grade, the fruit being of good colour and texture. The workmanship was good, and if deliveries could be kept up to this standard, I consider that they would meet with a good reception.

"1½ *Cubes.* Here again, the colour and texture were good, but a little more careful workmanship could be shown in the cutting of the cubes. Some of the edges of the cubes were ragged, and if this could be avoided, I think this packing would be entirely satisfactory to this market.

"1½ *Tall G.A.Q. Slices.* I was very impressed with the quality of this particular package. If deliveries could be made of a quality similar to that which I saw, I think it probable that the demand could be increased.

"1½ *Tall Cubes.* I should say that your samples were about average. Undoubtedly there is room for improvement, and although there were no white, hard, unripe cubes in the tins I saw, I consider that the colour was a little too pale to please the average dealer."

(*e*) "We should be very pleased and I think that most other importers of pines would also be very pleased, if their deliveries came in accordance with the samples which I saw opened. I should class both the Golden Cubes and the Slices and the G.A.Q. Cubes and Slices as wonderful deliveries of the grades, in fact, we have had deliveries of Golden fruit, only very slightly superior to the G.A.Q. which you opened. I do not remember ever having seen a tin of either Cubes or Slices, G.A.Q., as regularly packed, and as evenly yellow, and as regular in cutting as the tins that were opened. You could assure any shipper on the other side that, if they could make deliveries of grades, such as the samples which you opened, they would never have the slightest complaint on this side.

"In regard to your enquiry as to whether we think an improvement in the grading would cause a better price to be obtained from the Pines, I think that it would, but I think that there should be a marked difference in the grading of the three grades, and I would suggest that in order to endeavour to capture a percentage of the trade done in the South African and Australian round-cut slices, more attention is given to the packing of Golden round-cut slices, and that it might even be advantageous not to pack any spiral cut slices in the Golden grade."

(*f*) "However, I think that, even in accordance with the grading rules, the sample of the G.A.Q. Pines is higher than that called for by the rules, and I should very much doubt if canners generally could keep up to this standard, unless they had other markets for disposal of the slightly lower grade, of which I should imagine they would have an accumulation.

On the subject of syrup two views were expressed —

(*a*) "The specification that you have submitted to us is quite all right with the exception that we believe the sugar content is different from that which is now being used by the packers. The present sugar content is quite all right for the trade because ripe pineapples are naturally a sweet fruit and there is no necessity for a heavy syrup."

(*b*) "In regard to the suggested grading ,it appears to be reasonable, but I think that the syrup should be heavier in the Golden Grade than in the G.A.Q., and still heavier than in the Seconds. At the present moment, the percentage of sugar by weight, appears to be about 10 per cent. I think at least 17 per cent. should be the percentage for Golden, higher would be advantageous, about 10 per cent. for the G.A.Q., and rather under this for the Seconds."

The opinions expressed in these letters also show, as stated in the Agent's letter, that —

> " There is a general concensus of opinion that what is required in the first instance is the complete elimination from the shipments to the United Kingdom of the 2nd. Grade product, and that strenuous efforts should be made to effect this as soon as possible.
>
> " On the general question of grading there is less unanimity, but there is a widespread view that the G.A.Q. must be kept to a higher average standard than that of current shipments."

Appendix.

GRADED.

G.A.Q. Cubes.

(1)	25 Pieces.	Clean cut poor colour as a whole pass as 2nd.		9¼	oz.
(2)	29 Pieces.	17 good, 12 poor.	Fair	9½	,,
(3)	26 ,,	riper pine	Good	10	,,
(4)	26 ,,	8 poor colour	Generally good	10	,,
(5)	22 ,,	8 poor colour	Fair to good	9½	,,

Golden Cubes.

(1)	26 Pieces	)	Up to standard of	10½	,,
(2)	23 ,,	)	average Golden but	10	,,
(3)	23 ,,	)	not superior	10	,,

G.A.Q. Slices.

(1)	10 Slices.	Eyes not properly cut away 5 poor, 5 average	12½	,,
(2)	10 ,,	1 piece definitely overripe imparting sour smell to tin: 2 pieces poor colour 7 quite good	13½	,,
(3)	10 ,,	1 poor, otherwise good	12½	,,

Taking all together is an improvement on present G.A.Q.

Golden Slices.

(1)	10 Slices.	Similar to (3) G.A.Q. deep cut		12½	,,
(2)	10 ,,	4 poor	Fair Golden	13½	,,
(3)	10 ,,	2 poor	Fair Golden	13	,,

2nd. SAMPLES.

G.A.Q. Cubes.

(1)	22 Pieces.	Not uniform in size; 7 poor, 1 broken	9	oz.
(2)	27 „	Too light in colour; unripe; 12 worse than rest	10	„
(3)	22 „	4 poor, better than (1) and (2)	9½	„
(4)	24 „	A really good tin: 2 too light in colour	10	„

Cubes uniform in size—colour fair; can be classified as good.

Golden Cubes.

(1)	22 Pieces.	Fairly uniform, 1 broken, 2 light colour Generally too light.	10	„
(2)	23 „	Colour similar to (1) 7 poor—white spots and seeds	10	„
(3)	21 „	3 broken, 3 spots, similar colour	9¾	„
(4)	23 „	1 very spotty, 5 light colour	10	„

As a whole under-coloured. Fruit firm and uniform.

G.A.Q. Slices.

(1)	10 Slices	1 brown—overripe: 5 light, 5 medium light in colour	13	„
(2)	10 „	All patchy, colour lacking	11¾	„
(3)	10 „	Colour better 2 light white spots and seed marks	12½	„
(4)	10 „	Colour more uniform; many blemishes	13½	„

Fair sample of G.A.Q.

F. W. S.

Reviews.

Modern Coffee Planting.

By E. G. Windle. 220 pp. London: John Bale, Sons, & Danielsson Ltd., 83-91, Great Titchfield Street, W. 1. 1933. Price 11 *shillings.*

This book is essentially a practical guide to coffee planting, and being written in a popular style, will appeal more to the planter than to the scientist.

Although the book deals exclusively with the cultivation of Arabica coffee in the hills of Southern India, more particularly around the districts of Mysore, it contains much valuable information which may be successfully applied to the cultivation of other varieties of coffee on the plains, or Arabica coffee on the hills in Malaya.

After brief mention of the origin of coffee and the importance of the Arabica variety as the most valuable for hill cultivation, the author describes, in considerable detail, the various operations connected with the opening up of a coffee estate. Chapters III to VI deal with the laying down of nurseries, felling and clearing, method of planting the crop in the field, digging of pits to prevent soil wash, and finally, the establishment and control of shade trees.

The upkeep of the estate is dealt with in Chapters VII to XI, which treat at some length, such operations as weeding, topping, manuring, pruning and digging, while Chapter XII is devoted to methods of harvesting the crop and the preparation of the beans for market.

The question of control of diseases and pests is fully discussed in Chapters XIV to XVIII and the effect of spraying the bushes with either Bordeaux or Burgundy mixtures for the control of leaf disease is strongly emphasized.

Finally, in Chapter XX attention is drawn to good quality in coffee. It is stated that, although soil and climate have a considerable influence on quality, for a good outturn (*a*) good season, (*b*) coffee picked when fully ripe, and (*c*) good cultivation are required. It has been found in India that beans having the highest specific gravity invariably realised the highest prices. Further, the colour of the bean influences its market value and, on the home markets, East India is expected to be "coloury" coffee of a good, dark green colour. Apparently, different colour standards apply to various types of beans produced in other countries.

Since the author has had a long and wide experience as a practical planter of coffee and other crops under conditions obtaining in Southern India, the information contained in this publication should not be lightly valued.

The book undoubtedly contains a vast amount of information on the subject and should prove most useful to those planters wishing to improve their knowledge of coffee cultivation as practised in South India.

B. B.

The Culture and Marketing of Tea.

By C. R. Harler, 384 pages and index; 8 illustrations and 2 maps. Humphrey Milford. Oxford University Press, London, 1933. Price 12 shillings and 6 pence.

The author of this book, having completed fourteen years as a scientific worker at the Experimental Station at Tocklai, Assam, records the experience gained while connected with the tea industry in North-East India. Although chiefly concerned with tea-growing in that part of Asia, Dr. Harler has visited other important tea-producing countries and includes a descriptive account of the industry in Ceylon, Java and Japan. The book serves as a valuable introduction to the subject both from the scientific and practical aspect and is recommended to those interested in tea cultivation in Malaya.

The subject is dealt with in four parts. The first part describes the tea plant and its habitat and gives a general account of cultivation and manufacture. The botanical nomenclature of the tea plant agreed to is *Thea sinensis* (L) Sims. This name was used by Linnaeus in 1753 for the Chinese bush and employed by Sims in 1807 to include all varieties then known under one species. Adopting the classification of Cohen Stuart, varieties are confined to four groups based on leaf characters, height of the tree and original habitat.

The importance of vegetative propagation is stressed in connexion with selection. Crown grafting, budding, and upright stem layering have been employed with success in Java. Recent investigations in that country and Malaya, however, show that etiolation is a ready method of vegetative propagation.

Climatic and soil conditions are dealt with in separate chapters. Whilst the range of soil reaction tolerated by tea is a wide one, entending from pH 4 to neutrality, successful tea soils in North-East India usually show pH values between 5.4 and 6, *i.e.* are on the acid side.

Part II deals with the chemistry and pharmacology of tea which is of particular interest in connexion with manufacture.

The third part describes the methods practised in the most important tea-producing countries with special reference to North-East India. Two chapters are devoted to China and Japan, including Formosa. The Chinese methods are traditional and have been changed little by science, but both in Japan and Formosa modern machine processes are in use. A chapter on tea-tasting and terms used in describing teas is useful for reference when dealing with tea samples. The tea industries in Ceylon and in Java are described briefly in separate chapters.

The last part consists of two chapters summarizing production and consumption, and describes the tea markets of the world. Reference is made to the restriction scheme in force whereby the export of tea from producing countries is regulated and further planting held in abeyance. The scheme is to remain in operation in some form for five years and has already resulted in a very beneficial effect on tea prices.

J. N. M.

Departmental.

FROM THE DISTRICTS.

July 1934.

Compiled by the Chief Field Officer from Monthly Reports submitted by Field Officers.

The Weather.

During the early part of the month, weather conditions were universally dry. Towards the middle and end of the period heavy rains were experienced in Kedah bringing the monthly precipitation substantially above the average. Late rains in the coastal areas of western Johore caused a slight increase over the average, while in all other States, and the inland districts of Johore, the monthly rainfall was considerably below normal, with the exception of Malacca and the northern areas of Province Wellesley.

Remarks on Crops.

Rubber.—A substantial rise in price is reported from all centres, an increase of up to $6.00 per picul being recorded from Pahang South.

The regulation of production and incidence of padi planting have materially decreased the output. Moderation of tapping systems and improvement in sanitation is general. In the northern areas of Johore, however, tapping continues to be heavy in the Districts of Muar and Batu Pahat, though reports indicate that the tapping rate tends to decline and is only moderate at Segamat.

Unfavourable weather conditions tended to check the distribution and spread of mouldy rot disease. The voluntary control of this disease continues to be satisfactory, and extended sales of approved fungicides have been reported, more particularly from Negri Sembilan, where 336 gallons were disposed of to small rubber-holders. This disease, introduced undoubtedly from the mainland, was reported from Langkawai for the first time.

Padi.—In Province Wellesley south, central Perak, the coastal areas of Malacca and parts of Pahang, dry weather conditions delayed cultivation and nursery establishment. As a result of this setback some 200 acres at Padang Kampar in Pahang will not be cultivated during the current season. In most other centres, however, the planting programme is well advanced.

Large quantities of bones have been imported into Malacca from Kedah, Perak and Selangor for use as a fertiliser, at prices ranging from $2.50 to $4.50 per picul, depending upon size. A depot for the sale of Perlis phosphate has been opened by the firm working the Bukit Ketu deposits.

An aggregate of several thousand acres of dry padi interplanted among coconuts between Muar and Batu Pahat in Johore is now in ear, and a good crop is anticipated.

Coconuts.—Further progress in improved methods of copra production is reported from Province Wellesley, Pahang East and Johore, where extensions in the number of good types of kilns suitable for small holdings have been noted. A further consignment of copra from the State-aided kiln at Sri Menanti, Johore, averaged $2.92 per picul, while $3.15 was realised by a small holding manufacturer in Province Wellesley.

As a result of low prices ruling for copra, the possibilities of a profitable inland export of nuts from the coastal areas of Muar in Johore are now being investigated.

Tobacco.—New plantings aggregating 60 acres were reported from Kedah, while extensions to existing areas have been undertaken in Johore, and in the Raub District of Pahang, which maintains an appreciable export to Kuala Lumpur.

Tea.—In Malacca, Chinese small-holders are evincing much interest in this crop, and extensions to the planted areas have been undertaken at Machap and Sungei Petai.

Fruit.—The mid-season fruit crop was, on the whole, very poor. In Kedah, durians and mangosteens were in fair supply. In Negri Sembilan, these fruits, although not plentiful throughout the State, supported a considerable export trade to Singapore, more particularly from the sub-district of Rembau. In Perak the durian and mangosteen crops from Selama were poor, but moderate supplies of the former fruit were available at Bukit Gantang and Batu Kurau in Larut, at Kuala Kangsar, and also in the vicinity of Tapah and Tanjong Malim. Prices realised were fairly high and ranged from $7 to $9 per 100 at the beginning of the month. Selected durians from Batu Kurau realised from cents 15 to 25 each. The season in Malacca was extremely poor, mangosteens being a complete failure.

Agricultural Stations.

The total yield of green leaf harvested during the month at the Tanah Rata Experiment Station was 10,302 pounds, from which 1,992 pounds of made tea were manufactured. A break of 72 half chests was despatched to London during the month. Further progress was made in extending the areas under tea and coffee at this Station, while a site was selected and laid out to test the possibility of establishing lucerne by the application of fertilisers and the provision of shade.

At the Singapore Pineapple Station, fruiting continued throughout the month, returns falling off appreciably towards the end of the period. Experimental work on fertilising was continued. A crop of 428 pounds of green leaf of Deli and Jaffna varieties of tobacco was harvested and cured.

Satisfactory progress has been maintained at the stations under development at Kilanas in Brunei and Bukit Kallam in Labuan.

Padi Stations and Test Plots.

Favourable weather conditions enabled good progress to be made with cultural operations at the Telok Chengai Station in Kedah. Nurseries were manured and sown with local and improved selections. The distribution of selected seed to different districts was completed during the month.

In Krian cultural operations were well advanced and nurseries sown at Titi Serong Station; work on padi test plots has made good progress including the development of a new plot in the mukim of Bagan Serai. Dry conditions throughout the District caused some anxiety during the early part of the month; broken weather during the last week, however, materially eased the situation.

In other centres work is well in hand, and where established, crops look promising.

Felling operations were completed on 24 acres of the reserve for a padi station at Sungei Manik, and further progress has been made in connexion with the opening up of test plots at Tanjong Karang, Panchang Bedina and Sungei Haji Dinani in the Kuala Selangor District of Selangor.

Poultry.

Outbreaks of disease were reported from Sungei Bakau and Kuala Kurau in Krian District and from Selama town. Each case was investigated by a veterinary officer who attributed the outbreaks at Sungei Bakau and Selama to Diptheritic Stomato-pharyngitis.

An outbreak of fowl pox at Renglet was confirmed by a Veterinary Inspector from Kampar who gave advice regarding treatment.

The outbreak reported from Penggerang in Johore last month is now abating. Heavy losses have been sustained.

Rural Lecture Caravan.

The Rural Lecture Caravan was on tour in Perak during the month and visited nine centres in the Kuala Kangsar, Kinta and Lower Perak Districts. Instruction was mainly confined to mouldy rot disease control and poultry husbandry, except at Sitiawan, where lectures on improved methods of copra production were included. A satisfactory amount of interest was shown in the slides and exhibits demonstrating the subjects upon which concentration was focussed. The films as usual attracted large audiences.

Small-Holders Rubber Advisory Service.

In accordance with the recommendations of the Rubber Research Institute Commission of Enquiry that a service of Asiatic Instructors should be organised for instructional work in small rubber holdings, an approved scheme was inaugurated during the month, and nine officers, including eight Malays and one Indian, were posted for duty in Kedah, Negri Sembilan, Perak, Selangor, Johore and Pahang.

Instructors are recruited by and paid from Rubber Research Institute funds, and at the completion of their training are attached to the staffs of the State and divisional agricultural officers, who issue the necessary instructions and supervise and plan their work, in accordance with general lines drawn up by the Director of Agriculture, and the Director, Rubber Research Institute.

In most centres these officers have already accomplished useful work in obtaining information relating to small holdings, delivering lectures on improved methods of manufacture, and organising demonstrations on matters requiring improvement.

Note:—Local prices of various commodities are now published under Market Prices.

DEPARTMENTAL NOTES.

Death of Inche' Embi bin Hassan.

The death of Inche Embi bin Hassan, Notice Server, Taiping, which occurred in the early morning of 1st August, 1934, is recorded with deep regret.

Inche Embi joined the Department on 15th October, 1924, and has thus had just under ten years service, the whole of which has been spent in Taiping.

The staff in Taiping and other departmental officers who knew him wish to record their deep sympathy with his widowed mother in her bereavement.

Leave of Director of Agriculture.

Dr. H. A. Tempany, C.B.E., Director of Agriculture, S.S. and F.M.S., has been granted 7 months and 22 days full pay leave from 11th July 1934 to 4th March 1935 inclusive.

Mr. F. W. South, Chief Field Officer, has been appointed Acting Director of Agriculture during Dr. Tempany's absence on leave.

Pineapple Industry Legislation.

The Director of Agriculture and the Chief Field Officer attended a meeting at Singapore on 6th July, of the Committee appointed to recommend to Government regulations for the registration of factories and making of cans under the Pineapple Industry Ordinances and Enactments.

The question of a grading scheme was also discussed with Government officials and representatives of the industry.

Visits of the Director of Agriculture.

The Acting Director of Agriculture inspected various agricultural stations in Selangor on 25th and 26th July. He also paid official visits to Negri Sembilan and Malacca on 30th and 31st July, for the purpose of inspecting Agricultural Stations and Padi Test Plots.

Agricultural Advisory Committee.

A meeting of the Agricultural Advisory Committee was held at the Department of Agriculture, Kuala Lumpur, on 14th June 1934. A number of important subjects were discussed and the position regarding several lines of work passed under review. Amongst the more important subjects which engaged the attention of the Committee were the following:—Provision of funds for research work on pineapple canning; grading of pineapples and pineapple legislation; suggestions for the relief of the coconut industry; development of the rice industry; improvement of poultry in small holdings.

Leave.

Mr. H. J. Simpson, Agricultural Field Officer, returned from leave on 6th July 1934, and has assumed duty as acting State Agricultural Officer, Pahang.

Staff Change.

Mr. A. E. Coleman-Doscas, State Agricultural Officer, Negri Sembilan has been appointed to act as Chief Field Officer from 11th July 1934.

Statistical.

MARKET PRICES.

July, 1934.

Rubber.—The price of rubber continued its upward trend during July, improving from 22⅜ cents per lb. for spot loose in Singapore to 23½ cents per lb. at the close. The average price for the month in Singapore of Smoked Sheet, equal to London Standard was 23.53 cents per lb. as compared with 21.82 cents per lb. in June. In London the average price in July was 7.03 pence per lb. and in New York 14.51 cents gold per lb. as compared with 6.46 pence and 13.36 cents gold respectively in June.

Weekly prices paid during July for small-holders' rubber at three centres are shown in Table II.

Palm Oil.—The market rallied slightly during July and its course is shewn in the following table of the Malayan commodity: basis 5 per cent. f.f.a.

Table I.

DATE 1934.	PALM OIL			KERNELS
	L'Pool/Holland/ Hamburg c. i. f. landed weights in bulk per ton £. s. d.	L'Pool/Continent c. i. f. per ton net in barrels £. s. d.	Halifax (Nova Scotia) c. i. f. landed weights per lb. Cents gold.	Fair Average Malayan Quality c. i. f. Landed Weight per ton on Continent. £. s. d.
July 4	9 5 0	11 15 0	—	5 17 6
„ 11	9 5 0	11 15 0	—	6 2 6
„ 18	9 7 6	11 10 0	—	6 2 6
„ 25	9 15 0	11 15 0	2.20	6 2 6

Copra.—There was practically no change in the copra market in Singapore during July, the price for the sun-dried grade opening and closing at $2.95 per picul after touching $3.05. Shipments from the East as a whole for the first four months of the year show an increase of some 30,000 tons compared with 1933, so that the prospect of a sustained price advance seems remote. The average price for the month was $2.95 as compared with $2.93 in June. The mixed quality averaged $2.49 per picul as compared with $2.51 in the previous month.

Copra cake improved slightly to $1.10 per picul and rose further at the end of the month to $1.20.

Rice.—The average wholesale prices of rice per picul during June were as follows:—Siam No. 2 (ordinary) \$2.66, Rangoon No. 1 \$2.50, Saigon No. 1 (long grain) \$2.60 as compared with \$2.60, \$2.42 and \$2.50 respectively in May. Corresponding prices in June 1933, were \$3.83 and \$3.04 for Siam No. 2 and Rangoon No. 1 respectively.

The average retail market prices in cents per gantang of No. 2 Siam rice in June were:—Singapore 21, Penang 25, Malacca 23, as compared with 23, 25 and 23 respectivly in May.

The average declared trade value of imports of rice in June was \$2.93 per picul as compared with \$3 in April and \$3.10 in May of this year.

Padi.—The price paid for padi at the Government Rice Mill, Bagan Serai, remained at \$1.25 per picul while a private mill continued to pay \$1.30 per picul.

In Kedah the price rose steadily and reached the equivalent of \$1.25 to \$1.40 per picul by the end of the month. In Province Wellesley the price range was \$1.37 to \$1.50 per picul and elsewhere there was little change, the price varying from 5½ to 12 cents per gantang.

Tea.—The London price quoted for Malayan tea during June was 1s. 0¾d. For the same month, average London prices per lb. for tea consignments from other countries were as follows:—Ceylon 1s. 1.49d., Java 11.17d., Indian Northern 1s. 1.03d., Indian Southern 1s. 1.20d., Sumatra 10.89d. Prices of all grades declined during the month.

Tuba Root (Derris).—A much firmer tone prevails for roots sold on the basis of ether extract, the average Singapore price for July being \$34.50 per picul, an advance of \$4. Roots sold on rotenone content remained steady at the previous month's average of \$40 per picul.

Coffee.—The Singapore price of coffee improved slightly during July. Sourabaya coffee rose from a range of \$19 to \$21 per picul according to grade to \$19.75 to \$21.50, closing, however, at \$19 to \$21. Palembang coffee remained steady at \$13 per picul with a short rise during the month to \$13.50. The average for the month was \$13.12 as compared with \$12.85 in June.

Local prices for coffee beans have ranged from \$12 to \$38 per picul in various parts of the country.

Arecanuts.—Average prices per picul in Singapore during July were as follow:—Splits \$2.79 to \$4.19; Bila Whole \$2.44; Sliced \$11.62 to \$13.62; Red Whole \$4.12 to \$5.62; Sourabaya Whole \$5.12 to \$6.50; Kelantan Whole \$3.25 to \$3.59, the price within each range depending upon quality.

The average prices per picul quoted by the Singapore Chamber of Commerce were:—Best \$4.06, Medium \$3.75, Mixed \$3.10.

Gambier.—Singapore prices varied little during July, Block remaining steady at \$4 per picul as against an average of \$4.05 in June and No. 1 Cube improving slightly to close at \$7.50 per picul, with an average of \$7.38 as compared with \$7.30 in June.

Pineapples.—Prices advanced appreciably during the month on rather better demand in London and on reports of a falling off in the fruit crop, but at the end of the month, business was virtually at a standstill as buyers would not pay the higher prices. Average prices per case for July were as follows:—Cubes $3.19, Sliced Flat $3.15, Sliced Tall $3.35 as compared with $3.01, $3 and $3.12 respectively in June.

Prices for fresh fruits in Johore were:—First quality $2.40—$2.60, second quality $1.60—$1.70, third quality 90 cents to $1.50 per hundred. Prices in Singapore were $2.50 and $1.50 per hundred for first and second quality fruits. In Selangor prices ranged from 60 cents to $2 per hundred for large fruit.

Tapioca.—Prices in Singapore were lower during July but remained steady with the exception of a slight decline in Flake Fair at the end of the month. Average prices per picul were: Flake Fair $3.94, Pearl Seed $5.75, Pearl Medium $6 as compared with June averages of $4.33, $5.86 and $6.20 respectively.

Sago.—As usual the tapioca market was reflected in this commodity. Average prices per picul in Singapore were Pearl, Small Fair, $3.84 and Flour, Sarawak Fair $1.85 as against $3.84 and $1.85 in June.

Mace.—There was no change in the Singapore market for mace during the month. Prices remained steady at $70 per picul for Siouw and $50 per picul for Amboina as in June.

Nutmegs.—Prices in Singapore improved slightly during July, averaging $23.25 per picul for 110's and $24.25 per picul for 80's as compared with $22.50 and $23.50 respectively for June.

Pepper.—Prices eased off still further during July, the weight of stocks in England and America tending to depress the market, but firmed appreciably (especially White) at the close of the month on renewed enquiry from Europe. Average prices per picul in Singapore were:—Singapore Black $13.31, Singapore White $31.63, Muntok White $32.12 as compared with June average prices of $14.85, $33.60 and $3.40 respectively.

Cloves.—Singapore prices continued nominal at Zanzibar $35 and Amboina $45 per picul.

Tobacco.—Prices of sun-dried leaves have ranged from $7 to $50 per picul according to quality, in most parts of the country. The range in Kelantan was from $40 to $60, and in Johore from $30 to $75.

Table II.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, July, 1934.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.				Kuala Kangsar, Perak.		Batu Pahat Johore.			
	5	12	19	26	4	11	4	11	18	25
Smoked sheet		28.96	27.00	28.00						
Unsmoked sheet	25.06	26.00	26.71	26.51			23.00	24.00	25.00	25.00
Rubber*					24.00	25.55				
Scrap	15.00									

* Wet unsmoked sheet.

Transport by lorry Kuala Pilah to Seremban 15 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases at Kuala Kangsar on the 18th and 25th July.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Mackay & Co., Singapore.

1 picul = $133\frac{1}{3}$ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY.*

June 1934.

Malaya.—The imports into Malaya of foreign rice during June were 46,687 tons and exports 11,550 tons, net imports accordingly being 35,137 tons. The net imports for the period January to June 1934, were 221,292 tons, an increase of 10.3 per cent. over the corresponding six months of 1933.

Of the imports during June, 45 per cent. were consigned to Singapore, 15 per cent. to Penang, 6 per cent. to Malacca, 24 per cent. to the Federated Malay States and 10 per cent. to the Unfederated Malay States. Of the total, 69 per cent. came from Siam, 29 per cent. from Burma, 1 per cent. from French Indo-China and 1 per cent. from other countries. Of the exports during June, 69 per cent. were shipped to Netherlands India and 31 per cent. to other countries.

The various kinds of rice exported were :—Siam 6,891 tons (59.7 per cent.), Burma 4,064 tons (35.2 per cent.), Indo-China 381 tons (3.3 per cent.), India 42 tons (.3 per cent.), local production 172 tons (1.5 per cent.).

India and Burma.—Foreign exports for the period January to April, 1934, were 586,000, a decrease of 19.1 per cent. as compared with the exports for the same period of 1933, which were 724,000 tons.

The total exports of rice and bran from Burma for the period 1st January to 31st May, 1934, were 2,000,439 metric tons, as compared with 1,716,470 metric tons for the corresponding period of 1933, an increase of 16.5 per cent.

Siam.—The exports of rice from Bangkok in May were 169,367 tons; total exports for the first five months of 1934, were 748,195 tons as compared with 707,675 tons during the corresponding period in 1933.

Japan.—Formosa. According to the first estimate of the first rice crop of 1934, the area planted amounted to 712,750 acres, an increase of 5,160 acres or .7 per cent. as compared with the corresponding crop of 1933. Production is estimated at 603,600 tons, an increase of 51,200 tons, or 9 per cent., as compared with the actual results recorded for the same crop of 1933.

French Indo-China.—A report on the Saigon Rice Market for June, 1934, states that during the first fortnight, prices of padi fell as a result of the general fall in the price of rice. Arrivals from the interior were normal. During the second half of the month, prices rose with the rise in price of rice. It is probable that the renewed activity in the rice market will obviate a dangerous increase in stocks at Cholon.

Rice prices fell steadily and nearly reached the lowest level of the year owing to the threatened imposition of a quota on Indochinese rice importations into France in addition to an import tax of 10 francs per quintal. Better news from France and a number of orders from India caused a recovery in the second half of the month. Brokens :—Prices fell away markedly early in the month but recovered slightly and closed on a fairly firm note, owing to low stocks.

* Abridged from the Rice Summary for June, 1934, compiled by the Department of Statistics, S.S. and F.M.S.

Netherlands India.—According to the *Economic Bulletin* dated 1st June, 1934, the area of harvested padi (wet and dry) in Netherlands India during the first quarter of 1934, amounted to 1,450,631 acres as compared with 1,174,979 acres in the corresponding period of 1933, an increase of 23.5 per cent.

Imports of rice into Netherlands India (*Economic Bulletin* dated 16th June, 1934) during the first quarter of 1934, amounted to 39,353 metric tons as compared with 129,827 metric tons during the first quarter of 1933, a decrease of 69.7 per cent.

Ceylon.—The imports for the first half year of 1934, were 243,009 tons, showing an increase of 10.1 per cent. as compared with the imports of 220,768 tons for the corresponding period of 1933. Of the 1934 imports, 14 per cent. were from British India, 65 per cent. from Burma and 21 per cent. from other countries.

Europe and America.—Shipments from the East to Europe were 701,574 tons for the period 1st January to 28th June, 1934, as compared with 762,397 tons for the corresponding period of 1933, a decrease of 8 per cent.

Of the 1934 shipments, 45 per cent. were from Burma, 3 per cent. from Japan, 40 per cent. from Saigon, 9 per cent. from Siam and 3 per cent. from Bengal. The corresponding percentages for 1933, were 54, 3, 36, 6 and 1 per cent. respectively.

Shipments to the Levant from the East during the period 1st January to 7th June, were 19,055 tons as compared with 16,941 tons for the same period in 1933, an increase of 12.5 per cent.

Shipments to the West Indies and America from the East were 91,079 tons for the period 1st January to 10th June as compared with 65,352 tons during the corresponding period in 1933, an increase of 39.4 per cent.

MALAYAN AGRICULTURAL EXPORTS, JUNE, 1934.

PRODUCT.	Net Export in Tons.				
	Year 1933.	Jan.-June 1933.	Jan.-June 1934.	June 1933.	June 1934.
Arecanuts ...	20,756	10,613	17,250	1,428	1,999
Coconuts, fresh ...	100,609†	48,794†	45,695	11,129†	7,960†
Coconut oil ...	17,568	9,443	12,583	1,536	1,833
Copra ...	110,543	39,095	44,827	3,344	6,475
Gambier, all kinds ...	2,560	1,217	1,042	177	132
Oil cakes ...	9,992	6,013	6,191	1,231	1,220
Palm kernels ...	1,983	792	1,345	180	203
Palm oil ...	12,101	4,093	6,229	340	1,279
Pineapples canned ...	59,582	32,674	39,557	8,097	10,043
Rubber ...	459,836§	208,747§	235,446§	39,552§	24,203§
Sago,—flour ...	7,648	1,934	4,246	98	115
„ —pearl ...	2,646	1,049	2,123	163	348
„ —raw ...	4,420*	2,037*	2,899*	393*	499*
Tapioca,—flake ...	9,881	6,008	4,114	896	529
„ —flour ...	702*	141*	1,238*	40	340*
„ —pearl ...	17,297	7,975	7,941	1,023	1,199
Tuba root ...	569½	231	297	49	38

† hundreds in number. * net imports. § production.

MALAYAN PRODUCTION IN TONS OF PALM OIL AND KERNELS 2nd QUARTER, 1934.

(As declared by Estates)

	Palm Oil		Palm Kernels	
	F. M. S.	Johore	F. M. S.	Johore
April	912.7	169.5	307.5	58.8
May	749.0	154.1	444.0	88.4
June	721.0	116.6	543.0	104.0
Total	2,382.7	440.2	1,294.5	251.2

MALAYA RUBBER STATISTICS

Acreages of Tappable Rubber not Tapped on Estates of 100 Acres and over, for the Month ending June, 1934.

State or Territory	Acreage of Tappable Rubber end 1933 (d)	Estates which have entirely ceased tapping: Acreage	Estates which have entirely ceased tapping: Percentage of (3) to (2)	Estates which have partly ceased tapping: Acreage	Estates which have partly ceased tapping: Percentage of (5) to (2)	Area of Tappable Rubber never been tapped: Acreage	Area of Tappable Rubber never been tapped: Percentage of (7) to (2)	Total (3) + (5)	Percentage of (9) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Straits Settlements :—									
Province Wellesley	44,285	1,106	2.5	8,455	19.1	806	1.8	9,561	21.6
Dindings	7,368	112	1.5	974	13.2	109	1.5	1,086	14.7
Malacca	121,152	1,540	1.3	18,857	15.5	3,562	2.9	20,397	16.8
Penang Island	1,366	318	23.3	312	22.8	93	6.8	630	46.1
Singapore Island	28,842	4,831	16.7	4,158	14.4	744	2.6	8,989	31.1
Total S.S. ...	203,013	7,907	3.9	32,756	16.1	5,314	2.6	40,663	20.0
Federated Malay States :—									
Perak	253,227	4,206	1.7	37,761	14.9	12,325	4.9	41,967	16.6
Selangor	310,003	3,586	1.2	45,264	14.6	12,770	4.1	48,850	15.8
Negri Sembilan	233,592	8,623	3.7	35,773	15.3	19,429	8.3	44,396	19.0
Pahang	46,712	2,385	5.1	11,037	23.6	5,842	12.5	13,422	28.7
Total F.M.S. ...	843,534	18,800	2.2	129,835	15.4	50,366	6.0	148,635	17.6
Unfederated Malay States :—									
Johore	(c) 325,747	14,906	4.6	25,340	7.8	21,253	6.5	40,246	12.4
Kedah (a) (b)	126,588	12,123	9.6	15,631	12.3	18,048	14.3	27,754	21.9
Kelantan	25,793	5,451	21.1	2,735	10.6	4,147	16.1	8,186	31.7
Trengganu (b)	4,543	Nil	Nil	171	3.8	171	3.8	171	3.8
Perlis (a) (f)	1,181	159	13.5	192	16.2	318	26.9	351	29.7
Total U.M.S. ...	483,852	32,639	6.7	44,069	9.1	43,937	9.1	76,708	15.8
Total Malaya ...	1,530,399	59,346	3.9	206,660	13.5	99,617	•6.5	266,006	17.4

Notes :—(a) Rendered quarterly.
(b) Registered Companies only.
(c) Figures are for end December, 1932.
(d) Area out of tapping on Estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.
(e) Figures are as reported by estate managers.
(f) Figures are for end March, 1934.

MALAYA RUBBER STATISTICS

TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF JUNE, 1934 IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
	Ports	Dealer	Estates of 100 acres and over	during the month	January to June inclusive 1934	during the month	January to June inclusive 1934	during the month: Foreign	during the month: From Malay States & Labuan	January to May inclusive 1934: Foreign	January to May inclusive 1934: From Malay States & Labuan	during the month: Foreign	during the month: Local	January to May inclusive 1934: Foreign	January to May inclusive 1934: Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States ...	...	976	3,807	11,282	68,288	1,726	56,703	Nil	Nil	Nil	Nil	†12,135 *(3,880)	... *(931)	95,265	50,344	...	5,133	7,840
Johore ...	...	222	976	3,690	22,064	988	26,814	Nil	68	Nil	148	1,167	1,248	10,078	41,906	...	1,113	2,416
Kedah ...	...	6	436	2,653	16,372	194	9,279	Nil	Nil	Nil	Nil	1,224	102	8,706	17,814	...	289	1,674
Perlis ...	...	Nil	4	8	80	43	215	Nil	Nil	Nil	Nil	Nil	12	Nil	295	...	30	13
Kelantan ...	...	Nil	61	232	1,352	168	4,479	Nil	Nil	319	Nil	67	126	554	5,746	...	130	138
Trengganu ...	...	55	50	71	1,304	36	650	Nil	Nil	Nil	Nil	Nil	107	Nil	1,954		55	50
Total Malay States	...	1,259	5,334	17,936	109,460	3,155	98,140	Nil	68	319	148	14,593	2,526	114,603	118,059	...	6,750	12,131
STRAITS SETTLEMENTS :-																		
Malacca ...	...	551	369	1,381	7,912	445		1		4		2,721		21,394		...	1,051	672
Province Wellesley	...	12	144	884	3,462	32		Nil		Nil						...	136	448
Dindings ...	...	1	22	109	637	26	14,694	Nil	3,214	Nil	107,490	7,741	Nil	50,350	Nil	...	42	77
Penang ...	4,719	14,281	3	13	71	15		2,591		13,320						2,930	14,880	7
Singapore ...	11,858	58,336	82	189	1,070	18		18,389		105,048		28,280		164,472		7,554	55,149	158
Total Straits Settlements	16,577	73,181	620	2,576	13,152	536	14,694	20,981	3,214	118,372	107,490	38,742	Nil	236,216	Nil	10,544	71,258	1,362
TOTAL MALAYA	16,577	74,440	5,954	20,512	122,612	3,691	112,834	20,981	3,282	118,691	107,638	53,335	2,526	350,819	118,059	10,544	78,008	13,493

N.B.—In view of the abnormal situation during the months of May and June, and the combination in this return of exports from local areas with ocean-shipments from Malayan ports, the above figures should be read strictly in accordance with the footnotes.

† Ocean-shipments from Malaya of rubber direcly consigned from the F.M.S.

* Export of rubber from the F.M S. during June, 1934.

TABLE II

DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
20	21	22	23	24	25	26
DRY RUBBER	4,176	44,176	11,211	1,210	797	160
WET RUBBER	957	10,973	3,669	19	316	129
TOTAL ...	5,133	55,149	14,880	1,229	1,113	289

TABLE III

FOREIGN EXPORTS

PORTS	For month	January to June 1934
Singapore ...	39,634	233,692
Penang ...	11,390	77,566
Port Swettenham.	2,177	35,756
Malacca ...	134	3,805
MALAYA ...	53,335	350,819

TABLE IV

DOMESTIC EXPORTS 4

AREA	For month	January to June 1934
Malay States ...	17,014	223,904
Straits Settlements	1,155	
MALAYA ...	18,169	223,904

Notes:—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, *i.e.*, Column [9] = Columns [15] + [16] + [19] + [20] + [21] + [22] −[4]− [5]−[6]−[7]−[11]−[12]. For the Straits Settlements, Columns [9] figures for Singapore and Penang Islands represent sales or exports as shown by cess paid and for the mainland represent as purchases by dealers from local estates of less than 100 acres, reduced by 15 % to terms of dry rubber.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Domestic exports represent for Malay States, Province Wellesley, Malacca and Dindings net exports

METEOROLOGICAL SUMMARY, MALAYA, JUNE, 1934.

Locality.	Air Temperature in degrees Fahrenheit — Means of — A. Max.	Means of — B. Min.	Mean of A and B.	Absolute Extremes — Highest Max.	Absolute Extremes — Lowest Min.	Absolute Extremes — Lowest Max.	Absolute Extremes — Highest Min.	Earth Temperature — At 1 foot	Earth Temperature — At 4 feet	Rainfall — Total	Rainfall — Total	Rainfall — Most in a day. Amt.	Number of days — Precipitation .01 in or more	Number of days — Precipitation, .04 in or more	Number of days — Thunder-storm	Number of days — Fog morning obs.	Number of days — Gale force 8 or more	Bright Sunshine — Total.	Bright Sunshine — Daily Mean.	Bright Sunshine — Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.								
Railway Hill, Kuala Lumpur, Selangor ...	90.2	72.4	81.3	94	70	87	75	84.1	84.9	7.13	181.1	2.72	20	17	5	2		158.70	5.29	43
Bukit Jeram, Selangor ...	87.5	72.8	80.1	90	69	85	75	83.7	85.8	6.22	158.0	1.58	16	13	3	1	1	205.40	6.85	56
Sitiawan, Perak ...	89.6	73.3	81.5	92	71	87	75	84.4	85.2	3.01	76.5	0.64	16	12		1		209.50	6.98	57
Temerloh, Pahang ...	89.3	73.0	81.1	93	71	80	74	84.6	86.1	8.26	209.8	2.06	21	19		3		170.20	5.67	46
Kuala Lipis, Pahang ...	88.4	71.8	80.1	92	70	83	73	84.0	84.9	7.00	177.8	3.43	20	14	2	25		159.80	5.33	43
Kuala Pahang, Pahang ...	87.5	73.8	80.7	90	72	83	75	86.7	85.9	2.15	54.6	0.53	9	8	3			216.20	7.21	59
Mount Faber, Singapore ...	* —	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Butterworth, Province Wellesley ...	87.6	74.4	81.0	90	72	83	77	84.1	84.9	7.45	189.2	1.11	17	14	1			204.10	6.80	55
Bukit China, Malacca ...	84.4	73.7	79.1	87	71	82	75	83.1	84.3	8.85	224.8	3.00	21	17	3			170.15	5.67	46
Kluang, Johore ...	86.8	70.9	78.9	93	69	76	74	81.4	82.3	11.54	293.1	2.17	26	21	1	8		132.10	4.40	36
Bukit Lalang, Mersing, Johore	86.8	71.9	79.3	90	70	80	73	82.3	82.3	4.31	109.5	0.76	17	13	3	1		193.40	6.45	52
Alor Star, Kedah ...	88.2	74.6	81.4	91	72	82	77	87.0	86.4	5.67	144.0	1.42	17	15	4	1		223.35	7.45	59
Kota Bahru, Kelantan ...	89.9	74.0	81.9	93	72	87	76	85.2	85.4	5.93	150.6	2.13	11	8	2			249.10	8.30	67
Kuala Trengganu, Trengganu	88.9	72.7	80.8	92	70	85	74	83.9	84.9	9.73	247.1	5.04	10	7	1			229.00	7.63	62
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. Pahang ...	74.5	62.9	68.7	78	62	70	64	71.9	72.3	9.95	252.7	1.62	22	18	5	2		146.50	4.88	40
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	73.2	57.0	65.1	78	51	70	62	70.2	69.7	8.35	212.1	1.02	21	18				134.25	4.47	36
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	72.1	59.9	66.0	75	59	69	61			9.27	235.5	1.05	22	17				141.40	4.71	38

THE

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ERRATUM

Malayan Agricultural Journal. Vol. XXII No. 3, March 1934, p. 129. The Chinese name for *D. elliptica Changi No. 1* should be Lui Ting and that for *D. elliptica Changi No. 2* should be *Ney Kee.*

THE

Malayan Agricultural Journal.

SEPTEMBER, 1934.

EDITORIAL.

Vegetable Oils in Malaya.

Vegetable oils are an important factor not only in the welfare of the agricultural industries of Malaya, but in the domestic life of its inhabitants. The very serious decline in market prices of oils has affected a large proportion of our rural population. Recent political developments, having as their object the restriction and re-orientation of markets, have further complicated the position and have made necessary a close examination of the situation as it affects producers in Malaya.

The Malayan Committee appointed " to investigate and report on the present economic condition of the coconut and other vegetable oil-producing industries and to make recommendations " was therefore set a task of some magnitude, and its report, the publication of which is commendably prompt, is evidence of the very close study which its members gave to every aspect of the situation and the consideration of every factor which might be used to alleviate the very real distress in these industries.

The problems facing the producer of vegetable oils in Malaya are not peculiar to this country; they are the problems which face every country in which oil production is of importance. The views of this Committee, therefore, are of more than local interest and in order that our numerous readers overseas may be made conversant with the contents of a Report which is probably not easily accessible outside Malaya, we have devoted considerable space in this number to an abstract of the Report in question. This has rendered it necessary to omit certain regular features of *The Malayan Agricultural Journal*, an omission which we regret.

The imports of vegetable oils and oil seeds into Malaya in 1933 amounted to approximately 147,000 tons, valued at $11,000,000, and the exports to nearly 270,000 tons, valued at over $20,000,000. It must be remembered that in that year, although volume of production was maintained, the value was much below average.

The Committee deals with the subject in three main portions, *viz.* the coconut industry; the oil palm industry; other vegetable oil industries. The seriousness of the present economic position of the major of these industries is epitomised in the Report in the following words :—

> " It will be seen that the present position of all coconut producers is extremely difficult and precarious; it is comparable with that of rubber growers during the rubber slump and deserves very sympathetic treatment."

The Report reviews the general world situation respecting each of the important vegetable oils, deals more fully with the Malayan industry and examines the various means by which the present position might be alleviated and the future welfare assured. The recommendations, therefore, fall naturally into two groups; either they are concerned with temporary relief, or they suggest means whereby the future of the industry may be stabilised. In the former group are, for instance, recommendations for relief in rent, rates, export duties; in the latter are suggestions for impovement of the product, organisation amongst producers, extending markets.

The Report perhaps suffers from the very multiplicity of suggestions for improvements; the application of some will admittedly not go far towards the relief of producers, others may be to the benefit of the producer but to the detriment of the local consumer.

This method of treatment may make it somewhat difficult for the reader to decide upon which points the Committee desires to lay emphasis. It has the advantage, however, of giving the Report a wider appeal, for the points which may be of minor importance in one part of the Empire may possibly prove of greater value in another Colony.

The most important recommendations made concerning the local coconut industry are prohibition of further planting of coconuts, Empire preference and protection, substitution of coconut oil for other imported oils, and the better organisation of the industry. While any temporary alleviation such as may be given by reduction of rent would be much appreciated by producers, we believe that it will contribute but little to recovery without the inauguration of a closer organisation of producers. The Committee suggests the formation of a local branch of the Copra Producers' Organisation, and indicates many lines of investigation which should be the function of such a body. This seems to us a necessary provision if the industry is to expect assistance in any form either from Government or from other important bodies. The industry cannot expect material outside help if it is without organisation, and is unable to voice its opinions or represent its case as a concerted body. The fact seems fairly well established that the local market might absorb a much larger quantity of coconut products, and other markets might be developed if there was a " live " organisation of producers whose duty it would be, not only to protect the interests of coconut producers, but to develop the industry on up-to-date lines.

In relation to the oil palm industry, the Committee has less to say regarding methods of relief. It is of opinion that, owing to its excellent organisation, this industry is probably in a better position to weather the difficult situation than is the coconut industry. Suggestions are made, however, to effect some measure of relief.

Other vegetable oils receive the consideration of the Committee; in particular, groundnuts, gingelly and soya beans. These are of importance to Malaya, not because they are extensively grown locally, but because they are imported in considerable quantities and used for purposes for which locally produced coconut and palm oil might be substituted.

The Committee does not recommend restriction of production of either coconut or oil palm products, but does urge the curtailment of planting of new areas. In view of the fact that it is unlikely that important planting interests will be attracted to coconut planting and that restricted planting is to be allowed to small-holders (who are the most important producers,) it appears to us unlikely that the acceptance of this recommendation will have any material favourable effect on the situation, although it would appear to be advisable to create a safeguard against the possibility of any extensive planting in the next few years. In the case of oil palms a somewhat similar recommendation is made. Here, the small-holder is not concerned—he does not plant oil palms. The Committee suggests that there should be no further alienation of land by Government for oil palm cultivation, but that reserve land already alienated for the crop may be planted up. The total planted area in Malaya is about 64,000 acres, and unplanted reserves 47,000 acres. It is possible, therefore, that the planted area may be increased materially, after which available capital for this form of cultivation would be deviated from Malaya to other suitable countries in which there is no such restriction. It is unlikely, therefore, that restriction of planting will have any material effect on world production.

The report states:

> "The immediate outlook for the industries concerned is likely to be extremely difficult for some time to come; there appears to be little likelihood of an early recovery in prices, although in a situation so complex, the possibility of recovery and of expansion in the consumption of certain by-products must not be overlooked. So far as can be seen, however, recovery is more likely to take place by the elimination or reduction of certain sources of supply, while it is within the bounds of possibility that the position may become worse before improvement sets in.
>
> "It is conceivable, however, that some degree of regulation of further planting might be feasible, combined with some system of Imperial and International agreement for the admission on a quota basis of various oils and fats into consuming countries. In any event, it seems probable that only the most efficient and the cheapest producers are likely to survive under present conditions."

The keynote of future action is contained in the last sentence, and we suggest that readers should examine the report with this warning foremost in their minds.

THE PRESENT ECONOMIC CONDITION OF THE COCONUT AND OTHER OIL-PRODUCING INDUSTRIES.*

The General Situation of the Oils and Fats Industries.

The present disasterous fall in prices is the result of a combination of factors affecting a number of related industries; these factors cover a wide range of geographical and climatic conditions. The products concerned comprise not only coconut, palm and palm kernel oils, but also whale oil, soya bean oil, cotton seed oil, groundnut oil, olive oil and tallow, together with a number of other oils of lesser importance; the production of dairy butter and lard also has an important bearing on the situation.

All these oils are extensively used in the manufacture of margarine, lard substitutes, and cooking and edible oils; they are also employed in the manufacture of soap and toilet preparations, and on the condition of these industries the market for them depends. Moreover, margarine and lard substitutes enter into competition with butter and lard, so that any marked increase of production and corresponding decrease of price in the case of the latter will lead to decreased consumption of the substitute products, because domestic consumers prefer the genuine article provided it is within their means.

Owing to scientific advances it is now frequently possible to substitute one oil for another in manufacturing processes. Consequently, manufacturers have a wide range of choice in their raw materials and are able to take advantage of marked lowering in price of any of the more important vegetable or animal oils and fats by changing their formulae and their purchases to suit market conditions. It is seen, therefore, that the raw materials are closely interconnected, and over-production of any one may seriously affect consumption in any other, or all of the others.

There has been greatly increased production in practically all of these raw materials, and in several there is serious over-production. It seems not improbable that the total surplus may approximate to about one year's normal consumption.

Over-production dates back to the years succeeding the War, when prices for vegetable oils and fats rose to unprecedented figures. Consequently, all branches of the edible oil industry apparently offered attractive openings for capital and great expansion of the areas planted under oil crops therefore followed. Concurrently, increased capital was introduced into certain industries, notably the whaling and the soya bean industries, resulting in greatly increased supplies of these oils being placed on the world's markets.

* The following is an Abstract of the Report of the Vegetable Oil Committee appointed by H.E. The Governor of the Straits Settlements and High Commissioner for the Malay States on 21st April, 1934, and under the Chairmanship of Dr. H. A. Tempany, C.B.E., Director of Agriculture, Federated Malay States and Straits Settlements. The terms of reference were :—"To investigate and report on the present economic condition of the coconut and other vegetable oil-producing industries and to make recommendations."

On the other hand, there has been a steady decline in the consumption of margarine and probably, to a less extent, of soap. This has been accompanied by a steady increase in the production of butter which is now coming on to the world market in large quantities at prices which compete with margarine.

A further factor which has profoundly influenced the situation is general instability coupled with lessened purchasing power.

The present world-wide move towards economic nationalism has also considerably affected the position. As a result of the latter, Governments all over the world are vying with one another in fostering the production of such oils and fats as can be produced within their own boundaries. As a part of the campaign, higher and higher tariff barriers are being erected against foreign produce, quota systems are being introduced and in some cases, complete prohibition of the entry of certain fats has also been effected.

In the British Empire, under the Ottawa agreements and the British Import Duties Act of 1932, coconut, palm oil and kernels obtain a preference varying in different countries, which in the Report are set forth in some detail.

In France, vegetable oil imports are subject to a quota restriction; in Germany the importation of oils and fats is a Government monopoly and the imports allowed were nominally reduced in 1933 to 50 per cent. of imports in 1932. Quota restrictions on the importations of certain vegetable oils, including coconut oil, are also in force in Italy, Spain, Switzerland, Denmark, Czecho-Slovakia and Austria.

The position in the United States is the most disturbing of all, inasmuch as from 11th May, 1934, a processing tax has been imposed which has the effect of raising the duty by 3 cents a pound on imported foreign coconut and palm oils, the total duty becoming 5 cents per lb. on coconut oil and 3 cents per lb. on palm oil, *i.e.* £22.4.0 per ton on coconut oil and £13.9.0 per ton on palm oil (copra being taxed proportionately to its oil content).

The immediate outlook for the oil-producing industries is likely to be extremely difficult for some time to come; there appears to be little likelihood of an early recovery in prices, although in a situation so complex, the possibility of recovery and of expansion in the consumption of certain by-products must not be overlooked. So far as can be seen, however, recovery is more likely to take place by the elimination or reduction of certain sources of supply; it is also possible that the position may become worse before improvement sets in.

The remedy of artificial restriction of production is obviously inapplicable to the relief of the coconut and palm oil industries. Apart altogether from special difficulties in relation to these industries which would be formidable, if not insuperable, owing to the large proportion of native producers and the geographical distribution of these crops, it would also be necessary for effective control to regulate the output of all related oils and fats. Unless this could be achieved, limitation of production in the case of one or two products would merely lead to increased production of others.

It is conceivable, however, that some degree of regulation of further planting might be feasible, combined with some system of Imperial and International agreement for the admission on a quota basis of various oils and fats into consuming countries. In any event, it seems probable that only the most efficient and the cheapest producers are likely to survive under present conditions.

The Uses of Coconut Oil, Palm Oil and Palm Kernel Oil.

Coconut oil and palm kernel oil are principally used for the manufacture of margarine and soap, while glycerine is an important by-product. In the United States, prior to the imposition of the new processing tax, from 55 to 60 per cent. of the total consumption of these oils entered into soap, 25 to 30 per cent. into margarine and from 10 to 15 per cent. into other food.

Palm oil is used mainly in soap making, but an important addition is its use as a flux in the manufacture of tin plate, for which purpose nearly 7,000 tons were consumed annually in the United States. It is also used to a minor degree in margarine making.

Coconut oil is used in the margarine industry as a principal ingredient of vegetable oil margarine and no other oil which has been tried on a commercial scale has proved as satisfactory in making this type of margarine. In the United States, vegetable oil margarine is practically exclusively manufactured; elsewhere than in the United States, however, vegetable oils used in margarine manufacture have suffered from the severe competition of whale oil since, in Europe, hardened and refined whale oil is a major constituent of margarine.

Whale oil production is now in the region of 350,000 tons per annum. The increase is due primarily to the exploitation of the Antarctic waters and to modern methods of whale catching. Norway produces about half the world supply of whale oil, and Great Britain and British Possessions produce the next largest quantity.

The production of soya bean oil has also greatly increased of recent years and it has become a serious competitor with coconut oil in margarine making in Europe. The chief supplies are derived from Manchuria.

Before the art of refining, deodorising and hardening oils was as well understood as at present, some difficulty was experienced in utilising whale and soya bean oils, but now, taste and smell can be completely removed and a hard fat can be obtained.

The Coconut Industry.

The world acreage under coconuts is not accurately known, but a fairly reliable estimate in 1930 placed the area at about 7¼ million acres, as compared with 5½ million acres in 1921. British Empire countries account for slightly more than half the world acreage. Some part of the new acreage has not yet come into bearing, while other areas are not yet in full bearing; hence, the supply of coconut products should tend to increase for some years to come. The bulk of the production is in the hands of small-holders; large coconut estates prob-

ably do not account for more than 10 per cent. of the total. The world production of coconuts, in terms of copra, may be estimated at about 3 million tons. In 1929, the peak year, aggregate exports from producing areas in terms of copra amounted to only 1.7 million tons or under 60 per cent. of the estimated total production. It therefore appears that over 40 per cent. of the total production is consumed in the countries of origin.

The principal products of the industry are copra, coconut oil, fresh nuts, shredded and desiccated coconut together with coconut cake and meal, coir, arrack, toddy and shell by-products. Of these products, copra is, by far, the most important, although in recent years the manufacture of coconut oil in countries of production has increased considerably.

The net exports of copra from the principal producing countries in 1930 were 1,033,000 tons, of which over 401,000 tons were from the British Empire. The net exports of coconut oil in 1933 are estimated at 230,000 tons, of which 70,000 tons were derived from the British Empire.

Of the total world supply of copra in 1930, 35.7 per cent. was from Netherlands India, 15.1 per cent. from the British Southsea Islands, 16.5 per cent. from the Philippine Islands, 9.8 per cent. from Malaya, 8.7 per cent. from Ceylon, and 14.2 per cent. from various other sources. Of coconut oil exports, 73.6 per cent. was from the Philippine Islands, 21.8 per cent. from Ceylon and 4.5 per cent. from Malaya.

Although half the total area of coconuts is in the British Empire, Empire produce only comprises about one-third of the total exports from producing countries. This is due to the fact that India, which possesses the largest area under the crop, now exports no coconut products, and since 1914 has been an importing country.

Distribution of World Supplies among the Consuming Countries.

The principal copra importing countries in 1933 were:—United States of America 295,032 tons, France 196,644 tons, Germany 121,181 tons, United Kingdom 102,095 tons.

Before the War, Germany was the principal importer of copra with France, second. Since the War, however, the United States has been, by far, the largest importer, while the United Kingdom has also largely increased its imports of copra in recent years. In addition to imports of copra for crushing, a number of countries import coconut oil both from copra-producing areas and also from copra-crushing countries outside these areas.

Market Prices for Copra and Coconut Oil.

The price of copra both before the War and in the earlier years of the War was subject to substantial fluctuation; between January, 1911 and July, 1914, the average monthly price c.i.f. London for fair merchantable sundried Singapore copra lay between £21.2.6 and £31.2.9. During the War, prices rose to £45.15.0 in November, 1917. No further change occurred until after the

War, as prices of oil seeds were regulated until March, 1919, when the control was removed and the price fell to £33.10.0 Thereafter, the price again rapidly rose, the peak being reached in February, 1920, with an average of £69.10.0 per ton. Thereafter, the price sagged, until at the present time the lowest level recorded has been reached at £9.10.0 per ton. Prices for coconut oil have followed a somewhat similar course.

Characteristics of Copra and Coconut Oil.

The quality of copra varies considerably according to the degree of care exercised in its preparation. Well-prepared copra is white, of low moisture content and hard; it should be free from dirt, moulds and smoke and should contain from 4 to 6 per cent. of moisture and not less than 65 per cent. of oil. Well-prepared copra is less liable to mould attack and insect attack than low grade copra; the presence of excessive moisture conduces to the growth of mould which, in turn, favours the attack of insects, both leading to material loss in weight in transit, not attributable to moisture loss alone.

Generally, copra is classified according to its country of origin and is graded into two qualities. The higher quality is known as f.m.s. (fair merchantable sundried) although the term "sundried" does not necessarily describe the method of preparation—and is used as a trade description—and f.m. (fair merchantable).

The recognised order of merit of copra produced by various countries is shewn in a table. The first ten places are for the f.m.s. grade from Malabar (f.m.g.w.s.)*, Ceylon, Seychelles, Mauritius, West Indies, West Africa, Java, Straits, Dutch Indies, Samoa (Plantation). Ceylon f.m.s. commands a premium of 5 per cent. over Straits; Straits f.m.s. 15 per cent. over Southseas f.m.s., and 17 per cent. over Philippine f.m.s.; Straits Sundried commands 21 per cent. premium over Straits Mixed.

Copra is employed exclusively for the manufacture of coconut oil, the quality of which depends on the quality of the copra crushed. Good copra produces an oil with a minimum amount of free fatty acid, suitable, when refined, for edible purposes, whereas oil expressed from lower grade copra is mostly used for soap making.

The highest grade of copra was formerly that coming from the Malabar coast of India, but this is now consumed in the country of origin. The second place is held by Ceylon copra, but this is also coming on the markets in decreasing quantities, largely owing to the fact that India appears to be taking more and more of the Ceylon supplies.

Straits f.m.s. copra formerly ranked above copra from Netherlands India, but during the past two years the position has become reversed and f.m.s. Java copra is now graded higher than Straits copra. Southsea Islands copra, which is one of the largest sources of supply, is definitely of low grade.

The general indications are that, in the existing depressed condition of the market, the demand for high grade copra is increasing.

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* "Fair merchantable good white sundried". The term "sundried" and "kiln-dried" are terms of quality and do not necessarily indicate the method of manufacture.

Owing to the price grouping of copra according to the country of origin, it is difficult for any improvements in market quality effected by producers to meet with an immediate response of an enhanced price; this is said to be due to the fact that little interest is taken by buyers in individual consignments, although cases exist where estates, which have established a reputation for turning out high quality copra, can command a steady premium for their produce. On the other hand, a general upgrading of the quality of copra shipped from any country seems likely, in the long run, to meet with a better market demand.

Concerning the future outlook of the market, it seems problematic whether, at prevailing low prices, shippers can possibly maintain the present high rate of exports. Many estates unfavourably situated as regards cost of transport can only work at a loss and it is therefore doubtful whether they will continue to collect the nuts under present circumstances.

For the time being, it may be expected that the Philippine producers will continue to compete for the European business, but the possibility is not excluded that the present record crop may be followed by a smaller production next season.

As will be observed, there is unfortunately no improvement in sight in the price of copra. As for other oilseeds, visible supplies are plentiful, and with the existing low price of butter, the value of edible fats can hardly improve to any considerable extent. Therefore, it will only be a general improvement in world trade conditions, or an automatic drop in copra shipments, which can lead to higher prices for this article.

The Malayan Position.

In Malaya, coconuts are cultivated mainly in the neighbourhood of the sea coast and in particular on the west coast; moderately extensive native-owned plantations, however, occur along the banks of some of the larger rivers.

On the west coast and in the inland areas, the crop is usually cultivated on heavy clay soils, offering a marked difference in this respect from the majority of countries in which coconuts are grown. On the east coast, however, cultivation is on sandy soils. Various attempts have been made to grow coconuts on the peaty soils which occur at certain points, but, on the whole, the results have been unfavourable.

The area planted with coconuts in Malaya is estimated at approximately 637,000 acres, of which 315,000 acres are in the Unfederated Malay States, 240,000 acres in the Federated Malay States and 82,000 acres in the Straits Settlements.

Small holdings occupy a total area of approximately 500,000 acres; it is estimated that there are about 300,000 such holdings, the average size being 1.7 acres. Of the total area 1/7th represents immature areas.

Estate cultivation is mainly confined to the Federated Malay States and the Straits Settlements, the total area being about 125,000 acres. There are 165

coconut estates in Malaya of an average size of 670 acres, of which 37 are over 1,000 acres in extent.

The products of the industry comprise fresh nuts, copra and coconut oil together with a certain amount of toddy. There is at present little production of coconut coir or charcoal. The total production is, to a certain extent, a matter of conjecture, as a considerable proportion of the produce is consumed locally and of this quantity no records exist. It has, however, been estimated that the total average production for Malaya, in terms of copra, is 5.5 piculs (1 picul = 133⅓ lbs.) per acre, estates producing 10 piculs per acre and small holdings 4.6 piculs per acre. The Ceylon average has been estimated to be 8 piculs per acre.

In Malaya, it is not the practice to apply fertilisers to coconuts. Extensive and thorough drainage and careful sea-bunding are necessary if coconuts are to do well and this may be regarded as offsetting the saving at present effected in manuring.

The net exports of coconut products from Malaya in 1933 were approximately 9,000 tons fresh coconuts, 110,500 tons of copra, and 17,500 tons coconut oil—to the total value of over 11½ million dollars. The peak year was 1926, when the value of net exports of coconut amounted to over 25 million dollars.

The production of coconut oil has steadily increased of recent years, it is manufactured in 11 factories besides production as a cottage industry.

There is also a considerable entrepôt trade at Singapore and Penang in copra imported from Netherlands India and re-exported.

Of a total gross export of 210,585 tons of copra in 1933, 49.633 tons went to the United Kingdom, 17,618 tons to the United States of America, and 139,545 tons to European countries.

Estimated Capital Value of the Industry.

The capital value of the industry at the present time is estimated to be :—estates $50,000,000; small holdings $120,000,000 It appears that the sale value of small holdings has been halved since 1929. At present values of produce, the turnover of the industry is estimated to be :—estates $3,250,000; small holdings $4,500,000. In the year 1929, the annual turnover was estimated to be $27,000,000.

The f.o.b. cost of production in 1933 was $2.90 per picul as compared with $5.80 in 1929 (41 per cent. of this is represented by labourers' wages). Under emergency conditions in 1934, production with maximum efficiency gave an average anticipated f.o.b. cost of $3.30 per picul, reduced efficiency $2.75 and utmost economy $2.30 per picul.

Conditions on Small Holdings.

It is impossible to arrive at a similar estimate of costs of production on small holdings. In certain districts, where the holdings consist almost entirely of coconuts, severe poverty prevails. Wherever small-holders possess additional

resources, such as rice or rubber land, conditions are considerably better. The position constitutes a demonstration of the truth of the assertion that, in the case of a small-holder, dependence on pure stands of any one crop is a very insecure basis of livelihood.

Practically everywhere, small-holders are heavily in debt. It is usually most pronounced in the areas which have been longest settled. For the most part, these debts were contracted in time of higher prices. Under the present condition of affairs, there seems little hope of the majority of the small-holders ever being able to settle these debts in full.

Many of the lands have already been leased and in a few cases, especially where young coconut areas are concerned, the owners have abandoned their land. It is difficult to see anything, save a very sharp rise in the price of produce, of which there appears to be little prospect, which could markedly alleviate their difficulties.

The question is bound up with the general problem of rural indebtedness which is outside the terms of reference of the Committee.

In any event, it is important that these people should not be dispossessed of their lands and their crops; it is also important that desirable immigrant Malay population should be retained and re-emigration prevented so far as possible. In these circumstances, lenient treatment is indicated and dispossession of small-holders for non-payment of rent should only occur in the last resort.

The present position of all coconut producers is extremely difficult and precarious; it is comparable with that of rubber growers during the rubber slump and deserves very sympathetic treatment.

While no general control of output is applicable to the coconut industry in Malaya, yet low prices for oils and fats must in due course bring about natural restriction of output.

It is suggested that the present difficulties are largely the result of the uncontrolled introduction of capital into the oils and fats industries.

Prohibition of Further Planting of Coconuts.

It is recommended that no further alienations of large blocks of land for coconut planting should be made. Owing to the important part which coconuts play in the economy of the small-holder, such prohibition should not apply to small holdings, but in future alienation of land to small-holders, it should be stipulated that not more than 1/5th of the total area shall be planted in coconuts.

Empire Preference and Protection.

The principal markets have hitherto been on the Continent of Europe and in the United States of America. Restrictions on imports in the former area and the heavy processing tax recently introduced in America, hamper and restrict trade in copra. The American legislation may divert a large part of the enormous Philippine supplies to European and other markets.

Of the total world exports, about 40 per cent. is derived from the British Empire. In view of this fact, it is suggested that representations be made asking for preference and protection of Empire copra and coconut oil against the three serious competitors of coconut oil, which are wholly or in considerable part produced from foreign sources of supply, namely: soya beans, whale oil and cotton seed, which are at present admitted to the United Kingdom duty free.

It is suggested that the Imperial Government might consider the possibility of requiring that a fixed minimum percentage of coconut oil must be included in margarine produced and/or sold in the United Kingdom. Further, it is suggested that the Imperial Government should be invited to negotiate for the inclusion of British Empire coconut oil in the quotas for importation of vegetable oils and fats which have been established in various countries.

Expanding Malayan Foreign Trade.

India.—India is now a large importer of coconut oil and fresh coconuts. Exports from the Malabar Coast, which were at one time considerable, ceased in 1927. Ceylon exports to India have increased from 6,000 tons copra equivalent in 1929 to 54,000 tons in 1933. Malayan coconut oil exports to India have increased from 1,500 tons in 1932 to 7,200 tons in 1933. It is suggested that Malaya should endeavour to obtain an increased share of this market and should emulate the Ceylon plan of judicious advertising and investigation with this end in view. The fresh nut trade has been affected by an Indian tariff which places Malayan nuts in the same category for duty as nuts from Netherlands India, while Ceylon nuts are admitted on more favourable terms. It is hoped that present negotiations with the Indian Government with a view to obtaining favourable treatment for Malayan nuts may be successful.

The possibilities of further extending the present Malayan trade in Burma, Siam, and the China Coast is discussed, while attention is drawn to the probable increased demand in the future from Russia.

Present Unorganised Malayan Coconut Industry.

The present position calls for better organisation of the local coconut industry. There is in the country no organised body which can claim to speak for the industry as a whole. It should be of advantage if an organisation, representative of the coconut interests of the Peninsula, could be formed. Such an organisation might be a branch of the Copra Producers' Association, which it is understood, is in process of formation in the United Kingdom.

Expanding Local Consumption of Coconut Products.

The amount of coconut oil consumed locally compares unfavourably with the quantities used in countries such as Ceylon. This is in part due to the presence here of nationalities accustomed to use other kinds of oil. It is

thought that an extended consumption of coconut oil might result from propaganda and advertisement. The problem of extending the local consumption of coconut products consists, in part, of inducing a population which is accustomed to one form of oil to substitute another for it. Modern methods of refining render it possible, without difficulty, to remove the odour and taste of coconut oil, while it may also be possible, by judicious blending or other treatment, to impart to coconut oil the flavour of other oils such as groundnut oil.

Import Duties on Oils and Fats in Malaya.

The position regarding import duties is difficult by reason of the Customs systems in Malaya. At present, with certain exceptions, all classes of goods are freely admitted into the Straits Settlements, while duties at various rates are charged on certain commodities entering the Federated Malay States and the various Unfederated Malay States. These duties take little account of affording specific assistance to local industries, and are in need of revision. In the existing scale of duties there is considerable divergence between States and there are a number of anomalies.

A large entrepôt trade in copra is centred chiefly in Singapore. The imports consist mainly of low-grade copra from Netherlands India. The bulk of this is re-exported, but a certain proportion is crushed in Singapore and enters into competition with oil produced from Malayan copra on the Malayan markets.

Imports of Philippine copra are likely to occur in the near future, and unless steps are taken to prevent it, it is probable that the local market will be flooded with oil produced from Philippine copra which cannot find an outlet elsewhere. Under present conditions, no action seems possible in so far as concerns the Straits Settlements, but the Committee sees no reason why the Government should not consider the revision of tariffs so as to afford some protection to locally-produced oils and fats.

It is therefore suggested that the Governments of the Malay States should impose duties on any oils and oil-bearing materials which could enter into competition with coconut oil and are not at present taxed, while they should also consider the possibility of raising their duties with a view to increasing the use of coconut oil prepared from Malayan copra.

It is recommended that an import duty on foreign coconut oil be made equivalent to that borne by other vegetable oils, but that all oil produced from copra made in the British Empire should be allowed free entry into the Malay States. This may lead to the establishment of new oil mills in the Malay States and favour the expansion of trade of existing mills.

Soap Making.—There is an increasing industry in the manufacture of soap in Malaya.

There is no import duty on soap in the Malay States. The imposition of such a duty is recommended with preference to British soap.

It is further recommended that a Standing Committee of officials be appointed for the purpose of watching the situation regarding imports, the effect of import duties and similar matters.

Coconut Sweet.—Coconut sweet, so common in other tropical countries, is hardly seen in Malaya, and coconut biscuits and cakes are not made to any great extent. It is suggested that a cookery book or pamphlet containing instruction for utilising coconuts in domestic cookery might be prepared for use in schools and for general circulation.

Desiccated Coconut.—The Committee considers that the feasibility of extending the production of desiccated coconut for domestic consumption should be investigated and remarks that on this point some experiment and investigation is required.

Fresh Nut Sale.—The possibility of increasing the local sale of fresh nuts is considerable. There is a big disparity in prices of nuts in coconut-producing districts and of those in market towns situated at no great distances from these sources of supply. Co-operative effort is suggested to organise the supply of fresh nuts throughout the country. The regular supply of nuts to estates outside coconut areas suggests itself.

Grading standards for fresh nuts are a present need. The Committee thinks that a system of grading based on size of nut is needed.

In passing, a Coconut Exhibition is suggested as a means of extending the consumption of coconut products.

Direct Assistance to the Industry.

The direct assistance by Government can take three forms.

1. *Reduction or remission of export duties on coconut products.*—Export duty on copra in the Federated Malay States is 1½ per cent. *ad valorem*, with an addition of 1 cent per picul for research: coconut oil is free. In Johore, until recently, copra paid either 2½ or 5 per cent. export duty according to conditions of tenure of land. In Kedah, the duty amounts to 2½ per cent. *ad valorem*; in Kelantan and Trengganu, the export duties are 3 per cent. and 5 per cent. respectively, *ad valorem*. There is no export duty in the Straits Settlements, but estates pay assessment which on the average works out at approximately $2 per acre per annum.

It is recommmended that export duties on coconut products should be waived until such time as the price rises to a more profitable level. (This waiver should not apply to the cess for research). Export duty has already been waived in Johore from 1st June 1934, with an estimated loss of revenue of $50,000 per annum. Similar action in the Federated Malay States would involve a loss of revenue of about $40,000 per annum. The loss of revenue in Kelantan and Trengganu would be negligible.

2. *Rents.*—Rents on coconut land vary somewhat in different States: the average however, appears to be from $1.50 to $2 per acre. The Committee recommends a temporary remission of part of the rent on coconut land. As

an alternative, the proposal is made to reduce rent to a maximum of $1 per acre per annum, or the reduction of all rents by 50 per cent. Unplanted reserves should be regarded as planted areas and should be required to pay the same rent.

3. *Drainage Rates.*—These rates vary according to the original cost of the work and the cost of maintenance. At present prices of copra, and in two typical cases, these drainage rates amount to about 10 per cent. of cost of production of copra on estates and to 15 per cent. of the cost of production of copra on small holdings.

The Committee recommends that drainage rates should be reduced to an amount which represents the expenditure on upkeep of the works and should not include, for the present, any capital charges.

These recommendations for relief are intended to be only in the nature of a temporary waiver until such time as recovery in the price of coconut products warrants a return to the rates previously in force. It is pointed out that, if the recommendations already made for increased duty on certain imported oils and fats are approved, the increased revenue may, to some extent, offset the losses.

The suggestion of an export subsidy on copra of first quality was considered by the Committee. The conclusion was reached that on principle it was unsound, and in practice, it would involve so many administrative difficulties that the Committee was unable to recommend it.

Relief in the Straits Settlements.

The Committee considered that the Government of the Straits Settlements should favourably consider a reduction in the assessment so as to afford an increase of relief equivalent to that which would be accorded to growers in the Malay States, if the foregoing recommendations are approved. It appears that the question of assessment of coconut small holdings in the Straits Settlements may stand in need of revision.

Malayan Copra.

Annual exports of copra from Malaya are about 200,000 tons of which nearly half consists of imports from Netherlands India, so that the nett annual export production from Malaya is about 110,000 tons of copra. A considerable additional amount is crushed in local oil mills for consumption locally or for export. In 1933, nett exports of copra were 110,588 tons and of coconut oil 17,568 tons, which in terms of copra is equivalent to about 30,000 tons. It is estimated that a similar amount of coconut oil is manufactured and consumed locally, so that in 1933 the total output of copra in Malaya may be estimated to have been about 170,000 tons.

Malayan copra is marketed in two grades "f.m.s." (fair merchantable sundried) and "f.m." (fair merchantable). These are export grades artificially created at the point of shipment, copra from all sources, both local and

imported, being picked over, re-sorted and re-graded for export. It follows that Malayan exports are not necessarily 100 per cent. Malayan production; they may be graded and blended with copra from foreign sources.

Copra as received from estates and local dealers is usually classed as either estate quality or mixed quality, the expression "sundried" being often loosely applied to indicate copra of superior quality.

While the prices realised for individual lots of copra sold to dealers in the coconut areas on the same day show wide variations, the daily market quotations for Singapore and Penang show a definite difference in prices for copra of f.m.s. and f.m. qualities. With the gradual fall in price which has taken place, the difference between the market value of f.m.s. and f.m. copra has tended to become greater.

In 1926, this difference amounted to 3.1 per cent. of the ruling price but for the first six months of 1934 the difference amounted to 18.9 per cent.

This may be taken to indicate that under existing conditions, when there is an increased surplus of vegetable oils, the tendency is to discriminate more in favour of good quality copra.

Attention has repeatedly been drawn to the steadily deteriorating quality of Malayan copra. In 1929, a scheme of research work towards the improvement of Malayan copra was undertaken by the Department of Agriculture. The scheme has been in operation for the past five years and much has been done to indicate the manner in which Malayan copra can be improved and to disseminate the information to estates and small holdings. It has been shewn that the improvement of the appearance of Malayan copra to a quality equal to that of the highest grades produced elsewhere is relatively easy. Practically all estates have taken steps to improve their methods of manufacture accordingly, and in many parts of the country marked improvement has also taken place in the quality of the small-holders' produce.

In spite of these local improvements, the reputation of Malayan copra on the world's markets shews no improvement.

The mixing of imported copra with the Malayan produce may have a depressing effect on the reputation of Malayan copra. In view of this fact and of the possibility of increased imports of low-grade copra from the Philippines, it is suggested that an investigation of the influence on the reputation of local copra of large importations of inferior copra might be undertaken.

Estates that are preparing a high class copra which they ship direct are of opinion that the premiums they obtain are not commensurate with the extra labour involved in making it. It has been suggested that this may be due to lack of competition in the market, or to the fact that the consignments are too small to attract the large buyers. Enquiry into this question is recommended, leading to such alteration to the existing system of grading as may appear advisable.

The existing standard for the f.m.s. grade of Straits copra may be too wide and it is suggested that, in their own interests, producers should consider

the possibility of establishing a super-grade comprising the better part of the present f.m.s. grade and copra of specially good quality.

The Committee agrees with the feeling of estate producers that it is a sound policy to continue efforts to improve the standard of Malayan copra and it is believed that once a superior grade has become established and recognised locally, its acceptance by the European market will probably only be a question of time. In this connexion, group selling, as obtains in certain other industries, might be considered.

Coconut small holdings are mainly owned by Malays and until 1930, the nuts therefrom were almost entirely sold to Chinese dealers who prepared from these a very low grade copra on primitive kilns.

With the fall in prices in 1930 Malays were induced to undertake the preparation of copra. In consequence, a large number of primitive kilns were started throughout the country. More recently, thanks to the efforts of the Department of Agriculture, the Malay owners have erected at various points some 50 kilns which incorporate the latest ideas in relation to kiln construction. The change that has taken place in this respect is of considerable magnitude and importance. An extension of this scheme is therefore advocated.

There is evidence to show that small-holders are not in all cases obtaining full value for their produce. Fortunately, the existence of more or less open markets in Penang, Singapore and Klang have tended to counteract the formation of rings and combines among buyers with the object of depressing prices. Attempts to organise Malay copra-producers into groups for marketing their produce have so far had but little success, but the intervention of independent buyers has usually served to maintain a reasonable parity of prices. It becomes clear that so long as the small-holder who produces copra is more or less tied to selling it locally to small dealers, there will be little inducement for him to prepare good dry copra. If, however, he can be organised to sell a better product in a market which will pay for a better product, it will normally be worth his while to produce the better quality. The Committee therefore commends any efforts designed to persuade the small-holders to combine both for production and sale.

The Committee recommends that dealers in copra and coconut products should be licensed annually, with the object of preventing unfair practices and of checking thefts of coconuts and copra from estates and small holdings. It also recommends that current market prices for copra should be regularly posted at public points in towns and villages where coconuts and copra are bought and sold.

Malayan Coconut Oil.

Coconut oil is produced in 11 factories; there are also two oil mills on estates which at present operate on groundnuts, but which could undertake the production of coconut oil; there is also a not inconsiderable and growing industry in the preparation of coconut oil by small-holders.

The largest mill is situated in Singapore and the second largest in Penang. Both produce oil for local consumption and for export, and one of them is contemplating the introduction of a refining plant.

The production of coconut oil in Malaya for export is increasing. It might be an advantage if large mills could be established in the important coconut producing areas where none exist *e.g.*, at Bagan Datoh in Lower Perak, in the neighbourhood of Batu Pahat in Johore and possibly in Kelantan, with the object of stimulating local competition and raising prices for small-holders' produce.

Bulk shipment of coconut oil is not at present practical, probably because no facilities exist in Asiatic ports to which much of the oil is shipped. Bulk shipment appears to offer possibilities of further economies in production and, as this is a question which affects the industry as a whole, it is one which should receive attention. The production of coconut oil on estates may present possibilities and should also be carefully examined.

It seems probable that processes might be capable of being devised for improving the quality and keeping power of oil produced by small-holders. Investigations into this subject should be undertaken by the Department of Agriculture and if a satisfactory method can be evolved, steps should be taken to bring it to the notice of this class of producer.

By-products of the Industry.

Coconut Coir.—It seems doubtful whether any great prospect of success can attend the introduction into Malaya of a factory system of manufacture of coir. It appears, however, that the possibilities of developing a native coir industry in Malaya should be worth exploring. If the village inhabitants could be instructed in methods of preparing, spinning and weaving coir, a useful addition to existing industries could probably be made and a material utilised which at present goes to waste. It is suggested that this matter be considered by the Department of Agriculture, and if, on investigation, circumstances warrant such a step, a suitable officer should be sent to the Malabar Coast of India for the purpose of investigating the coir industry and acquiring practical details which would assist in developing and popularising the coir industry among small-holders in Malaya.

Coconut Shell Charcoal.—The making of charcoal from coconut shells seems worthy of attention. Such charcoal is reputed to be the highest class of charcoal fuel which can be produced. A considerable industry in the manufacture of shell charcoal exists in Ceylon, the produce being either sold in the village, converted to produce gas, or sold to smelting works in Colombo. Efforts should be made to popularise this industry among small-holders inasmuch as, like coir, it might represent a useful additional source of income.

Coconut as a Source of Alcohol and Sugar.—Coconuts are employed to some extent in Malaya as a source of alcohol and sugar, the palms being tapped

for this purpose. There is a considerable production of toddy for sale to estate labourers, also coconut sugar is produced to some extent in the villages. The production of arrack only occurs to a limited extent. It is doubtful whether in Malaya any great possibilities exist for extension in these directions.

Coconut Oil as an Illuminant and a Source of Power.—It is doubtful whether efforts should be made to re-popularise coconut oil as an illuminant in small holdings as it involves substituting an inferior article for one (refined mineral oil) which is definitely superior. Mixed with a mineral oil, however, coconut oil might be free from the objections to its use alone. Further investigations should be instituted on this subject and if found advisable, the information on the subject disseminated.

The possibility of using coconut oil as fuel in internal combustion engines has also been suggested, but the Committee doubts whether, even at present prices, it is likely to prove an economic proposition.

Freights on Copra.

The present position is that freights to Europe and America from Malayan ports are controlled by the Straits Homeward Conference, which also controls similar freights from neighbouring countries; the declared policy of the Conference is to maintain freights at a parity between the various points of shipment in the Far East. In the case of copra, however, this has been replaced by a system of six-monthly contracts since August, 1933.

The freights on oil seeds from Malayan ports have varied considerably during the past 20 years. At present the rate on copra from Singapore and Penang is 27s. 9d. per 12 cwt. nett weight. If, however, copra is shipped from Port Swettenham, it is subject to an additional arbitrary charge of 9s. per ton. This formerly applied to all classes of goods, but has been removed in the case of rubber.

Coconut producers and exporters urge that the freight rates are too high; that the elimination of competition for freight through the operation of the Conference operates adversely to the industry; that the arbitary charge on Port Swettenham shipments is unjust; that the alleged parity between shipment from different points in the region controlled by the Straits Homeward Conference has not been properly maintained; and that soya beans—which are an important competitor with copra on European markets—are carried from Manchurian ports at an open competitive rate and that the freight is lower than that on copra.

As against this, it has been urged that any decrease in freight rates would not bring any advantage to the copra industry because it would immediately be offset by a corresponding lowering in the c.i.f. price.

The Committee felt that sufficient weight may not have been attached to the fact that copra is selling in competition with a number of other oils and oil seeds which, owing to a variety of causes, have to bear much lower trans-

port charges. Consequently, any fall in the c.i.f. price would tend to improve the position of copra in comparison with its competitors and might lead to enhanced sales.

The Committee agreed that producers and shippers have a legitimate complaint as regards the more favourable position of foreign-produced soya beans and also that producers have a definite grievance in relation to failure to maintain the parity with Ceylon which has been established for some years. The Committee found it difficult to see what justification exists for the maintenance of the Port Swettenham arbitrary surcharge.

The elimination of competition for freights may not be entirely desirable, but the advantages which the Conference affords in the provision of regular and reliable facilities for shipment must not be overlooked. It would be unfortunate if efforts to expand the trade in the Far and Near East should be handicapped by the existence of freight rates which might act as a bar to expanding trade.

The securing of better terms for freight is bound to be a matter for negotiation; the establishment, therefore, of an organisation which can speak for the industry as a whole would serve a useful purpose.

It has been represented that the charges for wharfage levied on coconut produce by the Federated Malay States Railways at Port Swettenham are operating adversely to the coconut industry. The rates were examined and the conclusion was reached that compared with Singapore and Penang, the Port Swettenham charges are heavier, amounting to about 3 per cent. of the value of the goods at present prices. It is suggested that consideration should be given to the possibility of effecting some reduction.

Research in relation to the Coconut Industry.

Compared with other crops, the amount of research accomplished with reference to coconuts is relatively small, and much of it of recent date. At the present time the work has been extended in Malaya, which was the pioneer of systematic work on selection and manuring. Coconut research schemes are also in operation in Ceylon, and in the Celebes in Netherlands India.

In Malaya, research on coconuts is conducted by the scientific staff of the Department of Agriculture, and a specialist officer is attached to the Department for research work on copra. The cost of this work is met by a cess on copra exports from the Federated Malay States.

The Department conducts manurial, cultural and drainage trials and work on the preparation of copra on its coconut experiment station of 80 acres at Klang. The enlargement of this Station to about 200 acres is recommended.

The Department carries on co-operative manurial trials on ten estates. Work is also performed on insect and fungoid affections of the palm. An excellent bulletin containing an account of the various insect pests has been published, and the results of work on certain fungoid diseases have appeared from time to time in departmental publications.

Copra research work has continued uninterruptedly since 1929. It has comprised the investigation of methods of improving Malayan copra and has been shown to have had a marked effect on improving the quality of copra, both on estates and on small holdings. The Officer-in-charge visited Ceylon in 1930 and subsequently prepared a special bulletin (issued in 1931) which gave a full account of the Ceylon industry and suggested means for improving Malayan copra. A large number of other papers on various subjects connected with copra production have also appeared in the *Malayan Agricultural Journal* from time to time.

The value of the work performed is admitted and it is recommended that it should be further improved and, if need be, extended to include work on coconut oil and its utilisation in manufacturing and other processes.

Apart from this, more fundamental research is required, dealing, for instance, with the oil percentage of Malayan copra, and variations in quality and quantity of copra as between districts.

The services of the Officer-in-charge of Copra Investigations should be placed on a more permanent footing. His value to the industry is considerable and his specialised knowledge of the consuming and manufacturing side of the industry is particularly useful in view of the need for fostering and extending the use of coconut products. Arrangements should also be made for the continuation of his work when he is on leave.

The service is at present financed by a cess of 1 cent per picul on copra exported from the Federated Malay States, and a contribution thereto is made from Straits Settlements funds on a basis of 25 per cent. of the Federated Malay States contribution; formerly, it was partly supported by a contribution from Empire Marketing Board funds, but this ceased in 1932. No contributions are at present made to the work from the funds of the Unfederated States, notwithstanding the importance of the coconut industry in some of them, particularly in Johore, and of the fact that free use is now being made of the results of the work by Johore.

The cess should continue to be levied in the Federated Malay States and the Unfederatd Malay States should also be invited to contribute.

The sum at present provided in the estimate for the work, *viz.*, $12,000 represents the approximate yield of the Federated Malay States cess; when the Straits Settlements contribution is added to it, the funds annually collected for the purpose amount to about $15,000, the difference at present going to the Federated Malay States general revenue. This is not considered right; the industry has agreed to tax itself to maintain the work in a time of considerable difficulty and either the whole amount yielded should be applied for the benefit of the industry, or the cess in the Federated Malay States should be reduced to yield with the Straits Settlements contribution the amount required and no more.

The need has been shewn for increased provision of staff to enable the work to be extended; if the contributions collected in the Federated Malay States and from the Straits Settlements are made fully available and are supplemented by proportionate contributions from the Unfederated Malay States and particularly Johore, an adequate sum should be available for the purpose. Accordingly, it is recommended that the Director of Agriculture should be instructed to put forward appropriate proposals.

The need for increased provision for instructional services for small-holders has been indicated. There is at present one Malay officer whose work is concerned solely with instruction in relation to copra-making amongst small-holders. Regular courses of instruction in this subject to Malay officers of the Department and certain local headmen have been held at the Department of Agriculture with satisfactory results. In view of the need for further improving the production of copra, for extending the utilisation of coconut products in other directions, developing new uses and organising growers for manufacture and marketing, this provision requires extension.

A proposal for a staff of Asiatic Instructors for work in various States in connexion with the coconut industry was recommended by the Committee with one dissentient.

It was also recommended that the existing courses of training for local headmen and Agricultural Assistants should be extended to include other aspects of the coconut industry, and as the results of research in various directions became available, information concerning these should be included therein.

The Oil Palm Industry.

Oil palm products comprise palm oil and palm kernels; the former is derived from the fleshy pericarp of the fruit, the latter being contained in the seed; both are used as sources of oil, with the difference that palm oil is extracted in the countries of production, but the kernels are almost entirely shipped to European countries and America, where the oil is expressed.

Palm oil is utilised mainly for soap making, but a further field of utilisation is the tin plating industry in which it is used as a flux, and this is largely extending as a result of the growth of the food canning industries. The utilisation of palm oil in the manufacture of margarine and edible fats is small, and in certain other directions consumption has declined, notably in the candle industries and as a lubricant.

Palm kernel oil is used, on the other hand, in much the same way as coconut oil, which it resembles and for which it can be readily substituted in margarine and soap manufacture, and to a limited extent also for pharmaceutical and toilet preparations.

Palm oil and palm kernels are derived from the extensive belts which occur naturally in certain parts of West Africa, and more recently from the plantations established on an estate scale, particularly in Sumatra and Malaya. In French

Equatorial Africa and particularly in the Belgian Congo, important developments have occurred both in improving natural palm areas and also in establishing areas planted with oil palms on an estate scale.

The area of oil palm areas in Africa is unknown. In the East the planted areas in 1932 were:—Sumatra 169,000 acres, of which 89,500 acres were in bearing; Malaya 61,025 acres, of which 17,974 acres were in bearing.

The industry in both Sumatra and Malaya may be said to have developed almost entirely since the War. Between 1927 and 1932, the total increase in planted area in the two countries was 115,000 acres.

From a commercial point of view, varieties of oil palm fall into two main types, *viz.*, those of which the fruit has a thin pulp (pericarp) and thick shell, yielding a relatively small amount of palm oil and a large amount of kernels, and those of which the fruit has a thick fleshy pericarp yielding a relatively large amount of oil and a small amount of kernels.

The oil palms in West Africa largely consist of varieties which fall into the first class and it is from there that the bulk of the palm kernels and palm kernel oil supplies of the world are derived; the oil palms in the more recently developed areas consist, for the most part, of the second class and yield a higher proportion of palm oil.

In British West Africa, palm oil is extensively used by the indigenous population for cooking and as an illuminant and only a small fraction of the total production is exported. The production is almost entirely in the hands of the natives, whose methods are wasteful and inefficient. Despite recent efforts to encourage the producers to improve the condition of existing palms and to adopt better methods of extracting palm oil, progress has been small. The palm oil from this source, therefore, is generally of inferior quality, both from the point of view of cleanliness and acidity.

In the East and to some extent in the Belgian Congo and in French Equatorial Africa, the production of palm oil has proceeded on different lines, the product being planted on an estate scale and modern factory methods of extracting the oil being practised. As a result, the product is of much higher quality, being free from dirt and of low acidity. On this account, palm oil from these sources has acquired a position of recognised supremacy in the world markets and normally commands a premium over West African oil.

The total exports of palm oil from producing countries in 1932 were 272,144 tons, of which 126,862 tons were from the British Empire. In the same year exports of palm kernels were 620,986 tons, of which 395,038 tons were from the British Empire.

The export of palm kernels remains predominantly West African, but the East is yearly gaining an increasingly important share of the palm oil exports.

The rise in importance of Dutch and Belgian colonies and of British Malaya as palm oil producers is one of the outstanding features of the vegetable oils situation; its significance lies in the fact that their production is well planned

and scientific and the product is turned out with the minimum of waste and the maximum of quality.

In 1932, the total exports of palm oil from Sumatra and Malaya amounted to 83,000 tons, *i.e.* approximately 30 per cent. of the total world exports. It is probable that in five to six years from the present time the total output of palm oil from these two sources will be 180,000 tons and thus come within measurable distance of supplying the world's demand for palm oil if this does not increase beyond the present figure. If to this total be added the steadily increasing production from estate plantations in the Belgian Congo, the demand may exceed the supply.

The major supply of palm kernels comes from West Africa. Palm kernels produced in the plantation industry are generally of lower quality than the native produce of West Africa, owing to the methods employed in extracting palm oil from the fruit.

The indication, therefore, is for high grade plantation palm oil gradually to replace lower grade palm oil, obtained from natural sources, on the world markets, while palm kernels from natural sources will continue to hold the field for many years to come.

Distribution of World Supplies.

The consumption of palm oil rose steadily from 1924 to 1930; thereafter, it has tended to diminish. The principal country of importation is the United States, with England second and Germany third; in the United States and Germany, consumption increased very greatly between 1924 and 1932; in England it has remained steady. It has been stated that in the United States the only source of utilisation for which palm oil is considered indispensable is in the tin plating industry; the consumption of oil for this purpose in the United States of America is stated now to be 15,000 tons per annum. In the United Kingdom, the South Wales tin plate industry absorbs about 3,500 tons.

In 1933, the United States of America imported 125,585 tons of palm oil, the United Kingdom 61,720 tons, Germany 42,992 tons, Italy 48,975 tons and France 15,721 tons. In the same year, the most important importing countries of palm kernels were Germany 244,298 tons, United Kingdom 128,049 tons, Holland 29,060 tons and Denmark 20,890 tons.

The situation created by the imposition of the new processing tax on imported vegetable oils in the United States is bound, however, to have an equally serious effect on the market for palm oil as on that for coconut oil, and the outlook for the industry is on this and other accounts very difficult.

Market Prices of Palm Oil and Palm Kernels.

Palm Oil.—In the years immediately prior to the War, prices for palm oil (Bonny Old Calabar) were relatively stable at about £30 per ton. During the War, the upward trend was very similar to that of copra, though it did not reach such high levels, the price being fixed in 1917 at £48 per ton. On the removal

of control, prices rose to about double the controlled price in 1920, but falling by the end of that year to below it. From 1921 to the end of 1929 prices generally ranged from £31 to £38 per ton with a sharp rise in December, 1924 to £44 per ton which was, however, not maintained. Since 1927, prices have steadily sagged until at the end of May, 1934, they reached the unparalleled low level of £11.15.0 in barrels and £8.10.0 in bulk per ton.

Quality of Palm Oil.—Palm oil is sold on a basis of the content of free fatty acids. Bulked palm oil is exported on a 5 per cent. free fatty acid basis.

West African palm oil in barrels is sold at Liverpool on a basis of 18 per cent. free fatty acid, a bonus of 1s. 9d. per ton is allowed for each unit below 18 per cent., and a similar amount is deducted per ton for each unit in excess of 18 per cent.

There is also a market in Liverpool for plantation palm oil in barrels on a 5 per cent. free fatty acid basis. Malayan palm oil is included in this category.

Palm Kernels.—The market for palm kernels in the years immediately before the War showed relatively greater fluctuation than did palm oil, ranging between £16.12.6 and £24 per ton and averaging £20 per ton. In the early years of the War, the price sagged, but recovered in 1915; in 1917, the prices of palm kernels and palm kernel oil were fixed at £26 and £52 per ton respectively. On the removal of price control in 1919, prices jumped, £45 per ton for palm kernels and £110 per ton for palm kernel oil being reached early in 1920. Thereafter, prices sagged sharply to £18.10.0 for kernels and £40 per ton for kernel oil in 1921. Prices remained relatively steady until 1929 at between £18 and £22 per ton for kernels, and £35 to £44 per ton for kernel oil. By the end of 1929, prices again declined and by the end of 1933 kernels had fallen to £7.18.9 per ton. The decline continued and at the end of June, 1934, Malayan palm kernels were quoted at £5.15.0—the lowest ever recorded.

The Malayan Position.

Oil palms in Malaya are cultivated exclusively as an estate crop and alienation of less than 200 acres for planting with this crop is not permitted.

Cultivation is mainly confined to the States of Perak, Selangor and Johore, with smaller areas in Negri Sembilan, Pahang and Kelantan. The total planted area at the end of 1933 was 63,646 acres and unplanted reserves 47,021 acres.

Conditions in Malaya are particularly well suited to the cultivation of oil palms. The crop is planted on 33 estates, the average size of an estate being nearly 2,000 acres. The largest estate is situated in Johore and is 10,173 acres in extent. Of the total area, nearly 35,000 acres, or rather more than half, is controlled by two planting groups which also control considerable areas under the same crop in Sumatra. It is considered that the most economic unit for an estate is about 10,000 acres.

Of the total planted area, only about 12,000 acres can be regarded as being in full bearing; a further 19,000 acres are in partial bearing, while 32,000 acres

have not yet reached the production stage. It is, therefore, obvious that production is bound to increase considerably during the next five or six years.

Yield of Palm Oil and Kernels.

Yields are dependent on the character of the material planted. The earlier plantations in Malaya and Sumatra were established with unselected seed. A maximum yield of 1,600 to 1,700 lbs. of palm oil per acre per annum may be expected in such cases.

More recently, the planting of high-yielding selected seed has become extensively practised; when seed of this type is employed, yields in the neighbourhood of 1 ton or more of oil per acre per annum can be anticipated. In Malaya, about 30,000 acres or 50 per cent. of the total area have been planted in selected seed; that is, however, practically confined entirely to the more recently established estates which have not come into full bearing.

If yields are to be maintained, manuring is essential. A considerable amount of work on this subject has been performed in Malaya and Sumatra, and the manurial requirements of the crop are known with fair exactitude. The dominant fertilising constituent is phosphoric acid, and phosphoric dressings —usually in the form of ground rock phosphate—are now regarded as an essential part of planting practice.

In addition to palm oil, the palm kernels at an average rate of 3 cwt. per acre are produced.

Organisation of Production.

Oil palm estates are, in general, well planned and planted, and the majority of the factories modern and up-to-date. The larger estates are provided with excellent transport facilities.

The extraction of oil demands the use of moderately elaborate installations. Two alternative factory systems for oil extraction exist, *viz.* the centrifugal system, by which the oil is extracted from the fruit by a centrifugal plant, and the press system, by which the oil is pressed out in hydraulic presses. The efficiency of the alternative systems is about equal, although the press system is more expensive to install. In Malaya, seventeen centrifugal systems have been installed and three press systems.

Marketing of Produce.

Almost the entire crop is exported, though a limited quantity of palm oil is used locally in soap works.

Shipment of oil was formerly effected entirely in barrels, but in 1933 a company was floated for the shipment of palm oil in bulk by tank steamers, which has established a very efficient bulk shipment plant at the Tanjong Pagar Docks in Singapore, capable of handling the whole of the present production of the industry and of being increased to meet requirements as the industry

expands. One large company has established its own bulk shipment plant at Port Swettenham. Subsidiary bulking plants have been erected on certain estates, and arrangements have been made with the Federated Malay States Railways for the transport of oil to points of shipment in bulk in tank waggons. A certain amount of the crop is, however, still shipped in barrels, usually for destinations where facilities for the bulk handling of the product do not exist.

The marketing of palm oil in Malaya is controlled by a pool which includes all the more important producers. There are also two similar selling pools in Netherlands India which work in association with the Malayan pool.

An association of palm oil producers has been formed under the name of "The Palm Oil Producers' Association of Malaya" with the object of protecting the palm oil industry and affording members facilities for co-operation in matters affecting their interests.

Research on Oil Palms.

Throughout its development, the industry has made free use of scientific investigations and research and its present highly efficient condition is undoubtedly to a considerable extent due to this. Research work on many questions connected with the crop has been performed by the Department of Agriculture in Malaya and by the A.V.R.O.S. Experimental Station in Sumatra. Investigations have dealt with all branches of the industry, and the results published in the bulletins of these two organisations.

There are about 200 acres of oil palms under experimental cultivation at the Central Experiment Station at Serdang with an experimental factory.

A work on "Oil Palms in Malaya" was issued by the Department of Agriculture in 1927; this is now out of date and out of print; a new edition is in the press and will shortly be published which will provide an up-to-date and complete handbook for the industry.

The research work is closely followed by planters and the results of it are immediately applied; also the services of Government scientific officers are in constant requisition for advice and guidance. The industry is highly appreciative of the facilities afforded by Government in this connexion. In addition, certain of the largest planting groups themselves employ scientific officers for work on the crop. Between these gentlemen and the staff of the Department of Agriculture close collaboration exists.

When the highly organised condition of the palm oil industry is contrasted with that of the coconut industry, the difference is striking. It is obvious that the industry is in a much better position to meet emergencies than is the coconut industry.

Terms of Alienation of Land for Oil Palm Planting.

In the Federated Malay States, prior to 1925, a premium of $3 per acre and rent of 50 cents per acre per annum for the first 6 years and thereafter at $2 per acre were charged. Since 1929, the premium has been raised to $10

per acre with a rent of $1 per acre per annum for the first 6 years and $4 per acre thereafter with a rebate on such areas as are actually cultivated with oil palm. Provision has been made for the levying of an export duty of 2½ per cent. *ad valorem,* but this has not yet been imposed.

In Johore, the terms of alienation are a premium of $3 per acre with a rent of 50 cents per acre per annum for 6 years and $1 per acre thereafter.

Estimated Capital Value of the Industry.

It is computed that the total capital which has been invested in the industry amounts in round figures to $20,000,000.

Condition of the Industry.

The average cost of production of palm oil in Malaya is about 3 cents per lb. f.o.b. made up as follows:—field costs .60 cent; harvesting .45 cent, manufacture .40 cent, local transport .53 cent, other local charges 1.00 cent. Of these charges, 30 per cent. represents labourers' wages.

Three cents per pound is equivalent to £10 per ton c.i.f. European ports. About 3 cwt. of kernel are obtained for every ton of oil, but at the present price of £5.15.0 per ton the extra cost of production is stated to leave no margin of profit.

In these conditions, it is clear that oil palm estates in Malaya are, almost without exception, operating at a loss at the present time.

Unlike Sumatra, the arrival of the majority of plantations in Malaya at the bearing stage has coincided with the decline in prices. Nevertheless, until the end of March 1932, the level of prices was such that the average estate in bearing was in a position to cover its costs and if this price level had been maintained, could with progressive increase in yield look forward to moderate profits.

The situation has, however, completely changed owing very largely to the imposition of the American processing tax; it is impossible to foresee what the ultimate outcome will be, but obviously the situation requires the most careful watching and sympathetic treatment. The industry represents an asset of great value to the country on account of the capital embarked therein, the employment which it affords to a large number of people, and because it constitutes an outstanding example of development according to an ordered plan, while its present difficulties are due to economic and political events which could not have been foreseen.

Suggestions for Relief of the Oil Palm Industry.

The basic economic factors which apply to the oil palm industry are similar to those which relate to the coconut industry, so that, generally, measures applicable in the case of the one can be applied to the other.

There are, however, certain difference in size of the unit area operated; degree of organisation at present; difference in yield of oil per acre, variation

in range of employment of the products—coconut oil having the wider range of uses—difference in area under the two crops.

No measures of artificial restriction of production are recommended to meet the present situation and owing to its excellent organisation, it is thought that the oil palm industry is in a better position to weather this difficult situation than is the coconut industry.

Prohibition of Further Planting.

It is recommended that no new large-scale alienation of land should be made for planting oil palms. On the other hand, the planting of oil palms should not be prohibited on reserve lands already alienated for the crop; the economic size of plantation units is of importance in operation and, in spite of low prices, it may be to the advantage of certain properties to complete their planting programmes. In any event, the addition to planted areas that are likely to occur as the result of this, can have very little effect on the situation.

Relief by Regulation of Markets.

Relief by the intervention of the Imperial Government is recommended, with a view to regulating the admission to the markets of Great Britain and the Dominions of foreign whale oil, soya beans and cotton seed, which compete with palm oil as well as coconut oil from the British Empire.

It is understood that by certain methods of treatment, palm oil can be successfully used in margarine manufacture and it is suggested that the industry should explore the possibilities in this direction with a view to obtaining an increased share of the trade.

Expanding Malayan Foreign Trade in Palm Oil.

It is thought that opportunities exist for expanding exports to the markets of the Near and Far East and to Russia, and these should be investigated. The fact that the industry is already well organised for representation of its interests and for collective sales places it in a favourable position to undertake such investigation and negotiations.

Increasing Local Consumption.

The opportunities for expansion of local consumption are less favourable than in the case of coconut oil, colour, taste and smell being against it. Unrefined palm oil is particularly rich in Vitamin A and on this account is a very desirable article of diet.

It has been employed successfully in Malaya to replace butter fat in skimmed milk for feeding calves; with success in rearing puppies and also when fed to in-whelp bitches during the period of gestation and lactation.

An attempt to encourage its use in the above directions should be made by judicious advertisement.

Direct Assistance to the Industry.

As a temporary measure of relief in the Federated Malay States, it is suggested that quit rent on land alienated for oil palm cultivation might be reduced to the Johore level, *viz.* 50 cents per acre per annum for the first 6 years, and thereafter $1 an acre per annum—the relief to be regarded as being in the nature of a temporary waiver and to be subject to revision annually.

Reserves.—It is considered that, during the present depressed condition of the industry, insistence on the fulfilment of cultivation clauses should be postponed. In the case of all lands alienated for palm oil cultivation, appli- tion for relief from any penalties which may be liable to be imposed for failure to comply with the terms of alienation should be sympathetically considered.

Freight on Palm Oil.

There is a general feeling amongst producers that freights are too high. The rates for bulk shipment of palm oil quoted by the Conference are 51s. 6d. per ton as against 48s. per ton for coconut oil, and in both cases an extra charge of 2s. per ton for cleaning the tank is made. The reason for this differentiation is not obvious and it appears to discriminate heavily against palm oil.

Research in Relation to the Industry.

The industry should continue to receive assistance from Government in the matter of scientific advice and research; owing to the relatively small size of its export at present and the difficult position in which it is placed, it is obviously out of the question that the industry should at present be called on to contribute thereto. It is considered, however, that when the prospects of the industry improve and it is reaching the stage of full production, the question of its making some contribution to the cost of research should be considered.

Other Vegetable Oil Industries in Malaya.

The only edible oils and oil-bearing materials of vegetable origin, which are of major importance locally, other than coconut and oil palm products, are Groundnut (Kachang) oil, Gingelly (Sesame) oil and Soya beans.

Groundnut Oil.

The oil is derived from the fruit of the leguminous plant *Arachis hypogaea*, which receives its name from the peculiar habit of ripening its fruit in the ground. It is an annual crop and takes about five months to mature from time of planting.

The fruits, which have a slightly sweet, nutty flavour, contain about 30 to 50 per cent. of oil according to variety.

The cultivation of the crop is world-wide, being grown largely in North and South America, in parts of Africa, and also extensively for export and local consumption in India, China and Netherlands India.

The oil comes on the market in two forms—cold-pressed and hot-pressed; the cold-pressed oil is nearly colourless and has an agreeable taste and smell and is largely used for edible purposes; the hot-pressed oil is of a yellow colour and is used in soap manufacture. The press cake is very rich in nitrogen and on this account is highly prized both as a stock food and as a manure.

The world's export production of groundnuts is in the region of 1,200,000 tons. The largest exporters are India, China, Nigeria, Senegal and Gambia.

Malayan Position.

Groundnut oil is the principal oil consumed by the Chinese population and large quantities of oil and groundnuts are imported annually, the oil from imported nuts being extracted in local oil mills. The nett imports into Malaya in 1933 were 11,730 tons of groundnut kernels and 6,856 tons of groundnut oil, to a total value of $2,434,638. In 1932, 98 per cent. of the imports of groundnuts came from Netherlands India; 63 per cent. of the oil from China and 37 per cent. from Netherlands India.

In 1933, duties for revenue purposes, were imposed on groundnuts and groundnut oil imported into the Malay States and in the same year under the Ottawa Agreement, differential duties were added, whereby a preference was accorded to groundnuts produced in the British Empire. In the Straits Settlements, however, groundnuts from all countries are admitted free of duty.

The imposition of the differential scale of duties has led to an appreciable increase in the importations of groundnuts from India. Imported groundnuts are crushed and converted into oil both in Singapore and at certain points in the Federated Malay States. Under the Ottawa Agreement, groundnut oil expressed in the Straits Settlements is regarded as a manufactured article and, as such, is admitted to the Malay States at the British preferential rate of duty, provided it can be shown that 25 per cent. of the labour and/or materials employed in its manufacture are British. In consequence, oil millers in the Federated Malay States complain that they are placed at a disadvantage inasmuch as, while they are restricted to the use of Empire groundnuts, their competitors in Singapore labour under no such restriction and can obtain their groundnuts from a cheaper and nearer foreign source of supply.

There appears to be foundation for this complaint, but in existing circumstances, it is not easy to see what remedy can be applied.

It appears, however, that the definition of a manufactured product may not be devoid of difficulties and it is arguable whether groundnut oil can be classified in this category.

Groundnuts are grown to a small but increasing extent locally; the cultivation is practised by Chinese small-holders and the crop is grown in rotation with vegetable and other crops.

The total area cultivated under the crop in Malaya in 1933 was estimated to be 1650 acres. It is cultivated in the Federated Malay States, mainly in Perak and Selangor, and in the Unfederated Malay States, mainly in Johore and Kedah.

Under favourable conditions, it is possible to obtain two crops per year off one piece of land, so that 400 lbs. to 800 lbs. of oil per acre per annum can be obtained, the rate being halved if only one crop is taken.

Prices for groundnuts have ranged from an average of £19 per ton in 1929 to £11 per ton in 1933 c.i.f. European port.

Gingelly Oil.

This oil is extracted from the seed of *Sesamum indicium*, an annual erect-growing bush, of which the small flat seeds contain about 50 per cent. of oil.

India is the largest grower of gingelly. The world's production is estimated to amount to about 750,000 tons and exports to 150,000 tons. The largest exporter is China.

The seeds contain 40 to 50 per cent. of oil. Gingelly is a bland oil, nearly colourless and without smell. If carefully prepared, it keeps sweet; it is used for cooking and edible purposes. In India, it is also used for anointing the body, for illumination and for the manufacture of soap.

Malayan Position.

Considerable quantities of gingelly seed and oil are imported into Malaya annually. In 1933, 2811 tons of gingelly seed and 24 tons of oil were imported to a total value of $264,680.

In Malaya, the oil is largely used by Indians, and the recent diminution of imports is attributed to the considerable repatriation of Indian labour that has occurred. The oil is for the most part expressed by Indians in the vicinity of large towns, small wooden mills of the mortar type operated by bullocks being employed.

Under average conditions, the crop grows well in Malaya, and it is somewhat surprising that it is so rarely cultivated. The crop takes three months to mature from the time of sowing the seed; yields vary from 500 to 1,000 lbs. of seed per acre per crop.

Gingelly oil is subject to duty on importation into the Malay States, differential duties having been imposed in favour of Empire products as part of the Ottawa Agreement. Gingelly seed pays no duty.

Soya Beans.

The soya bean is the seed of a leguminous plant indigenous to China, Japan and Indo-China. The largest producers are China and Manchuria. The annual crop is estimated at 13,000,000 tons, of which 5,000,000 tons come from Manchuria. It is also grown extensively in the East in Korea, where annual

production is about 560,000 tons, Japan about 375,000 tons and Java about 100,000 tons. Exports from China and Manchuria average about 2,000,000 tons a year with the addition of a further 100,000 tons of oil—equivalent to 700,000 tons of beans.

The crop is now also cultivated on a large scale in the United States, where in 1931 the total area approximated to 3½ million acres, the crop amounting to 121,000 tons, and in Russia, where in 1931 the total area was stated to be 1,100,000 acres. With the restriction of imports of coconut oil and palm oil into the United States consequent on the processing tax, the further expansion of soya bean cultivation in that country seems probable.

Attempts have been made to grow the crop in India, Burma, South Africa and Australia, but, so far, without success. In Malaya, experimental work by the Department of Agriculture has shewn that the crop will grow fairly well and it is cultivated to a small extent by Chinese market gardeners, but all attempts to popularise it have, so far, failed.

The crop yields about 600 lbs. of beans per acre; the seed contains 16 to 20 per cent. of oil and has thus a much lower oil content than the other oil-bearing materials which have been considered. It is extensively used as an edible oil and for margarine manufacture; before the art of refining was as well understood as at present, some difficulty was experienced in deodorising the oil satisfactorily, but now the taste and smell can be completely removed. The nett imports of soya beans into Malaya during 1933 were 13,207 tons, shewing a sharp increase over the previous year.

There is, however, no industry in Malaya in extracting the oil from the beans; consequently, soya beans can hardly be considered as competing with locally produced oil-bearing materials, although the possibility of their doing so must not be overlooked.

Recommendations regarding Groundnuts, Gingelly and Soya Beans.

In view of the need for extending the consumption of locally produced coconut and palm oils, marked encouragement of the cultivation of other vegetable oils that may compete therewith should be avoided.

The replacement of groundnut oil by coconut oil and palm oil in domestic consumption in Malaya is desirable. The process of replacement is, however, likely to be gradual; it may lead to the placing of blends of coconut oil with groundnut oil on the market and the erection of refining plant for coconut oil and will probably have to be accompanied by propaganda designed to popularise the change.

Imports of groundnuts and groundnut oil are bound to continue for some time, and the moderate extension of groundnut cultivation for the production of oil for direct consumption or for blending should not be discouraged.

The replacement of gingelly oil by coconut oil should prove easier of accomplishment.

While soya beans are not at present a direct source of oil for domestic use, the possibility must not be overlooked. The imposition of a duty thereon in the Malay States should be considered.

The appointment of a Standing Committee to advise the Governments concerning duties on oils and fats has already been recommended and it is considered that this question should be referred to it.

Oils and Oil-bearing materials of minor importance in Malaya.

There are a number of other vegetable oil-bearing materials capable of being produced in Malaya, which might compete with coconut and palm oils, but which are not at present of sufficient importance to need more than passing reference. The most important are: cotton seed, kapok seed, maize, tea seed, illipe seed, mahua and sunflower seed, and a number of others.

Mention should also be made of Piquia oil obtained from the fruit of a South American tree, yielding an oil not dissimilar to palm oil and of which a plantation was established some years ago in South Kedah. The prospects for the extension of its cultivation do not appear to be particularly favourable and the oil has not, so far as is known, appeared on the market.

There are also a number of non-edible oil-yielding crops which could be grown, notably castor oil, which is extensively cultivated in India and elsewhere; the prospects for its successful cultivation in Malaya do not, however, appear to be great. Castor oil is used as a lubricant, in soap making and as a medicine.

Tung oil, yielded by various species of Aleurites, has also repeatedly attracted attention as it is derived from plants which might be capable of being grown in Malaya. It is chiefly employed as a drying oil for use in paints; it is also used in China as a wood preservative and as an illuminant. It is chiefly produced in China and is in steady demand; the plant is now also being grown in several countries, notably the United States of America.

The results of experiments have shewn that its cultivation offers small prospects of success on the plains in Malaya.

Rubber Seed Oil.

Although rubber seed oil is hardly a commercial product at present, it demands more than passing reference owing to the fact that large quantities of rubber seed are produced annually on rubber estates in Malaya. In 1929, it was estimated that the total yield of rubber seed was about 225,000 tons per annum from a planted area of 2¼ million acres, and from the present planted area of about 3¼ million acres the estimated production is probably in the region of 300,000 tons. It is, of course, impracticable to collect the total amount produced, but it is probable that about 100,000 tons per annum could be gathered and marketed.

Rubber seed consists of approximately 40 per cent. shell and 60 per cent. kernel. The seed contains approximately 25 per cent. of oil, calculated on the whole seed, so that the annual potential output on the basis of 100,000 tons of exportable rubber seed would be approximately 25,000 tons. The oil itself is

a semi-drying oil, that is to say, it is capable of being used in the manufacture of paint, although its qualities in this respect are inferior to those of linseed oil; it can also be used for the manufacture of soap. It is uncertain to what, if any, extent it could be used as an edible oil. Under the Rubber Regulation Enactments, the export of rubber seed from countries adhering to the International Agreement is prohibited.

It appears that no duties are at present levied on rubber seed or rubber seed oil imported into the United States of America and as a result, renewed enquiries have lately been received from America as to the possibility of developing a trade in this product. It seems possible that means might be devised for sterilising rubber seed prior to export, so that the risk involved of sending out viable seed would be minimised, although it could not be entirely removed; or, alternatively, if the seed was decorticated locally before export and the export of undecorticated seed prohibited, the same end could be secured.

On the other hand, such a trade would involve adding one more source of supply of oil to the already over-stocked world market and, in view of the fact that the imposition of the United States processing tax is apparently designed to assist the American farmers, it seems not unlikely that, if a considerable import of rubber seed or rubber seed oil into the United States developed, it might only be a question of time before a similar duty was imposed on rubber seed. On the whole, it is undesirable to make any special arrangements to facilitate export of this product.

Volatile Oils.

The only other vegetable oils which have any importance locally are volatile or essential oils. There is a small trade in the cultivation and distillation of patchouli and citronella in Johore, Province Wellesley and Penang, while cloves are also grown in Penang and Province Wellesley to some extent. As, however, these constitute an entirely separate and distinct industry, they need only be mentioned.

Abstract.

EIGHTEENTH REPORT ON NATIVE RUBBER CULTIVATION IN NETHERLANDS INDIA.

First Quarter 1934.

Prepared by the Bureau of Agricultural Economics of the Agriculture Fishery Service of the Netherlands Indian Department of Economic Affairs at Batavia, Java.

Prices.

Price variations continued as a results of increased American consumption and the confidence felt in the satisfactory conclusion of the restriction negotiations.

Java standard sheet at Batavia rose from 13.8 guilder cents per ½ kg. in December 1933, to 14.4 cents in January 1934 while average prices in subsequent months were 15.6 guilder cents in February and 16.3 guilder cents in March per ½ kg.

The price for medium blanket advanced to a greater extent than did the price for the estate product, *i.e.* from 9.3 guilder cents per ½ kg. in December 1933 to an average of 13.2 guilder cents per ½ kg. in March 1934. In relation to the sheet prices, the blanket price in December was 67.4 per cent. thereof, in January 70.1 per cent., in February 77.5 per cent., and in March 81 per cent.

Exports.

Exports of native rubber reacted to these improved prices. Whereas the export of such rubber in the last quarter 1933 was 38,954 metric tons, that of the first quarter 1934 was 50,714 tons, the monthly figures being: January 1934, 15,293 tons, February 14,675 tons, March 20,746 tons. The lower exports in February are attributable to the short month and to the fact that in many rubber regions padi was being harvested.

The provinces exporting rubber may be divided into two groups. The first group comprises the provinces of Palembang, East Coast of Sumatra, Tapanoeli, Sumatra West Coast, Banka and Dependencies, and Achin and Dependencies—in all of which the exports have greatly advanced in the past six months. In the second group are Western Borneo, Djambi, Riouw and Dependencies and, to a lesser extent, also the South and East Sections of Borneo. In these Provinces the export increase has proceeded but very gradually.

The large increase of rubber exports from the provinces in the first group is due to the fact that the tappable rubber is still considerably in excess of the area actually tapped and also that, up to the end of the first quarter, there was

no great scarcity of labour. In this quarter no factors intrude to any important degree which would tend to limit production.

In the second group, labour shortage may be the reason for the slower increase of exports. Labour will flow from the thickly populated parts growing foodstuffs to the more thinly populated rubber districts, but rubber production in such regions will vary, as food production is of first consideration.

It is not possible, in view of the greatly extending rubber tapping, to give an estimate of the proportion of the tappable rubber now in production; the various reports, however, indicate that extensive areas, especially in Djambi, Palembang, South and East Borneo, and Western Borneo, were not being tapped towards the end of the quarter under review.

Local Reports.

Achin and Dependencies.—At the end of the quarter 60 per cent. of the tappable rubber was being tapped. To an increasing extent, tappers were being employed on wages. The price of wet slab at Langsa advanced from fully *f* 8 per 100 kg. in January to *f* 15 in March.

Tapanoeli.—Exports by way of Sumatra West Coast and Pakan Baroe were maintained at fully 200 tons per quarter. The two rubber factories produced 322 tons of blanket sheet, as against 487 tons in the fourth quarter 1933. This regression reflects an important improvement in quality of the native product (sheety crepe), of which only a small amount was unfit for direct export and required re-milling.

Tapping coolies are generally paid in produce, yet wages have been reported in some cases. The improved conditions in the rubber regions have resulted in a general price increase for necessities, so that it was possible for rice export regions (such as Toba) to profit from the rubber revival.

Sumatra West Coast.—A considerable increase of tapped area is reported, but extensive areas of tappable rubber are still left untapped. Most of the labour is still family labour, while tappers receive as wages two-thirds of the product.

Palembang.—Exports increased from 5,666 tons in the last quarter of 1933 to 9,893 tons in the first quarter of 1934. Tapping areas were extended, both on new areas and on previously tapped areas.

Prices in the interior ceased to follow Singapore price increases.

Djambi.—Due to scarcity of labour there was no increased rubber production.

Riouw and Dependencies.—The production remained fairly constant, due to labour shortage.

Banka and Dependencies.—Exports increased from 265 tons in the last quarter of 1933 to 634 tons in the first quarter of 1934.

In the last report, mention was made of an increasing preparation of sheet rubber and of a considerable import of rubber mangles. This development

greatly increased in the first quarter of 1934. At the port of Pangkal Balam, 132 rubber mangles were imported in the period under review.

The quality of rubber has greatly improved; nearly all rubber is now worked up into sheets.

Western Borneo.—The exports in the fourth quarter 1933 were 7,620 tons, and increased to 9,887 tons in the first quarter 1934. Work is mostly effected by family labour in the smaller holdings, but in the larger holdings labourers from the district on wages are employed.

South and East Borneo.—The exports from this region from August 1933 up to the present time averaged from 2,400 to 2,500 tons a month. Only after the west monsoon wet padi had been harvested and the east monsoon wet padi fields had been planted did a distinct reaction to better prices become evident, when many labourers left the thickly populated Oeloe Soengei region for the thinly populated rubber districts in the hilly country, to exploit the rubber holdings on a share basis.

Tapping extended along the east coast of Borneo, so that in March some rubber was exported from Samarinda.

Rubber factories shewed increased activity and towards the end of the quarter under review, they were working at full capacity.

Departmental.

FROM THE DISTRICTS.

August, 1934.

Compiled by the Chief Field Officer from Monthly Reports submitted by Field Officers.

The Weather.

In the northern half of the Peninsula the rainfall exceeded average. With a few exceptions, precipitation was below average in the southern areas. Conditions in Johore and Singapore were hot and dry practically throughout the month.

Remarks on Crops.

Rubber.—Prices remained firm throughout the month and showed an increase in all States over those of the preceding period.

In some centres instructional activities have resulted in the manufacture of improved sheet, with a consequent premium for quality.

With the exception of Malacca and Johore, where tapping is heavy, more particularly in the latter State where multiple cuts are reported to be tapped two or three times daily, excision is conservative due partly to regulation, but mainly to the exigencies of padi cultivation.

Further improvement in the maintenance and sanitation of holdings has been recorded, while disease control has received a satisfactory measure of attention. A steady demand for approved fungicides has been maintained.

Coconuts.—There has been a decline in the production of good quality copra from small holdings as a result of unsatisfactory prices. It is reported that increased interest has been taken in the manufacture of coconut oil.

Copra from improved types of small holdings kilns realised up to $3.30 per picul, which represents at the present time a high standard of quality.

Padi.—In Kedah, Perak and the Province satisfactory weather conditions enabled good progress to be made with cultural and planting operations. The rice caseworm *Nymphula depunctalis* was responsible for much nursery damage in the southern mukims of Krian, and flood damage affected some 497 acres at Padang Lallang in the Kota Star district of Kedah.

Work in Pahang is well advanced, but portions of Negri Sembilan and Selangor are backward. Transplanting in the inland districts of Malacca is practically complete, but the preparation of land within the coastal belt has been delayed owing to lack of water.

Conditions at Segamat and Tangkah in Johore are satisfactory, but in other centres little work has been done, and much land left uncultivated.

Tobacco.—Prices have remained steady in Johore except in Segamat district where supplies have been plentiful. The area under this crop at Kluang has been extended. The export of dry leaf from Jerantut in Pahang to Kuala Lumpur has been maintained.

Fruit.—In Negri Sembilan, durian, langsat and rambutan are in season in the Kuala Pilah District, and durian and rambutan are being harvested in Jelebu. The crop is small but of good quality. A good crop of machang is reported from Pahang, but durians in that State have been disappointing. The mango season in Krian was extremely poor.

The main fruiting season for pineapples ended early in the month. Owing to shortage of supplies of fruit a number of the factories have temporarily ceased operations.

Agricultural Stations.

The total crop of green leaf harvested during the month at the Tanah Rata Experiment Station, Cameron Highlands, was 7.969 pounds from which 1,506 pounds of made tea were manufactured.

Satisfactory distributions of planting material have been maintained from all Stations.

An area of twelve acres of jungle land has been provisionally selected for large scale experimental work on pineapples in southern Johore.

Padi Stations and Test Plots.

At the Telok Chengai Station in Kedah, all planting was completed under excellent weather conditions. A new experiment to ascertain the effect of not cutting back nursery seedlings was laid down.

Planting commenced and good progress was made at the Titi Serong Rice Experiment Station, where nurseries benefitted considerably by favourable rains throughout the month.

With the exception of short term padi, planting was completed at the Pulau Gadong Station, Malacca.

Good progress has been made on all padi test plots including developmental work on new areas in Perak and Selangor.

Rural Lecture Caravan.

The Rural Lecture Caravan commenced an extended tour of Pahang, and at the end of the month had visited most of the important centres on the Pahang river between Temerloh and Pekan.

Carp Rearing.

A further 3,000 fry were received from Singapore and delivered to a breeder at Chat in Pahang. A former consignment is making good progress

in the ponds at Benta, and has now reached a size of approximately two kati (nearly 3 lbs.) each. They are being fed on guinea grass and tapioca leaves.

An experimental consignment of fry from Singapore to Kelantan, despatched in sealed containers with an excess of oxygen in the water, arrived in excellent condition. This method of transport reduced costs which were previously unduly high.

Pigs.

A serious outbreak of swine fever occurred in the Seletar district of Singapore towards the end of the month. The Agricultural and Veterinary Departments are co-operating in an endeavour to control the epidemic which has caused breeders considerable losses.

Home and School Gardens Competitions.

The half-yearly judging of school gardens was completed in Province Wellesley and Penang during the month. The general standard of work in many of the gardens was very satisfactory.

171 entries have been received for participation in the home garden competition organised in Pahang, where a similar competition for school children is being arranged.

Penghulus' Course of Instruction.

In connexion with the special course of instruction for Penghulus, organised by the Department of Agriculture, during August, 35 Penghulus from the Straits Settlements and Federated Malay States attended a course of rice instruction at the Pulau Gadong Rice Station, Malacca. A course of lectures, complemented with field demonstrations covering the more important principles of husbandry, was delivered during the period August 19th to 22nd.

The M.A.H.A. Magazine.

Vol. IV, No. 3, July 1934. Price 30 cents.

The current issue of *The M.A.H.A. Magazine*—the official organ of the Malayan Agri-Horticultural Association and of the Selangor Gardening Society, contains, amongst other interesting features, two original articles, the first dealing with the planning of a medium-sized garden by F. Flippance; the second, by E. J. McNaughton on the Food Requirements of Plants. These authoritative articles may be confidently recommended to gardening enthusiasts.

DEPARTMENTAL NOTES.

Obituary.

Mr. C. B. Holman-Hunt, B.A. (Cantab), F.E.S., F.Z.S.

We regret to announce the death, at the age of 68 years, of Mr. Cyril Benoni Holman-Hunt, which recently occurred in London following an operation.

Mr. Holman-Hunt was appointed Curator of the State Museum, Selangor in 1909 and was transferred to the Department of Agriculture, Straits Settlements and Federated Malay States, in the following year as Assistant Entomologist, an appointment he retained until 1917 when he was promoted Systematic Entomologist. He remained in this post until his retirement from Government service in January, 1922.

He had a wide knowledge of the East, having resided both in Ceylon and India before coming to Malaya; being engaged in practical agriculture during this period, his experience was of value to his work in this Department. The old files of the *Malayan Agricultural Journal* will be found to contain numerous articles by him on the subject of Entomology which was not only his specialised subject, but which had always been his principal hobby.

The rapidly-thinning ranks of his contemporaries in Malaya—both his colleagues in the Department and his other friends throughout the country—will regret the passing of a man with an attractive, loyal, and cheerful personality.

"Penghulus'" Course.

A course of instruction for "Penghulus" (local Malay headman) was held in two parts between August 8th. and 22nd. 1934. The first part was held at the School of Agriculture, Malaya, at Serdang from August 8th. to 18th., 44 attending the course. The subjects included nature study, marketing of village produce, small holding credit, improvement of small holdings, poultry husbandry. Visits were made to the Central Experimental Station, Serdang, where practical subjects studied included fruit cultivation, tobacco, coffee and other annual crops suitable for small holdings. The course was conducted by officers of the Department of Agriculture and of the Co-operative Societies Department.

For the second part of the course, from 19th. to 22nd., the party was distributed so that each penghulu could study subjects of particular importance to his own district. One party, consisting of 9 penghulus, went to the Klang Coconut Experiment Station for a course of lectures and practical work on the manufacture of copra; another party of 7 were at the Department of Agriculture, Kuala Lumpur, where officers of the Rubber Research Institute of Malaya were in charge of the course. Lectures were delivered on the preparation of good quality rubber, husbandry of small holdings, pests and diseases. Practical demonstrations were given in coagulating and machining, tapping, soil conservation, and treatment of mouldy rot disease. A visit was also paid to the

Rubber Experiment Station at Sungei Buloh. The third party, of 35 penghulus, proceeded to Malacca where at the Pulau Gadong Rice Station lectures were delivered dealing with the subjects of the various cultural operations, field estimation and measurement, pests and diseases: pure strain padi, method of selection and advantages; the importance of maintaining pure strains: advantages of communal work. Practical work included field demonstrations.

DISTRICT AGRICULTURAL SHOWS.

Kuala Selangor District.

The third Kuala Selangor District Agriculture Show was held on August 4th, 1934 and was opened by His Highness the Sultan of Selangor.

Exhibits in most classes were numerous. Fruit exhibits were few in number, owing to a poor mid-year crop, but of good quality. The vegetable section was the most outstanding feature of the show. Although not numerous, exhibits of coconut products, rubber and poultry were of a very satisfactory standard.

Departmental exhibits were staged by the Health, Co-operative and Agricultural Departments. A number of lectures, illustrated by lantern slides, were delivered on improved methods of copra production and on poultry management by a member of the Department of Agriculture.

Ulu Langat District, Selangor.

The third District Agricultural Show was held at Kajang on August 26th, 1934. The Show was opened by the Hon'ble Mr. F. W. South, Acting Director of Agriculture, S.S. and F.M.S.

The Show was not as successful as on previous occasions, insufficient notice having been given for the preparation of exhibits. With the exception of the Schools and Poultry Sections, exhibits were few in number. The Arts and Needlework and the Poultry Sections were very satisfactory and the exhibits of better quality than on previous occasions.

The Department of Agriculture staged exhibits and an officer of that Department delivered lantern lectures on poultry. The Health Department displayed exhibits concerning sanitation in the *kampong*, scavenging and conservancy, anti-malarial work and prevention of infectious diseases.

Statistical.

MARKET PRICES

August, 1934.

Rubber.—The price of rubber still continued to rise during August, opening at 23⅝ cents per lb. and closing at 25½ cents per lb. for spot loose in Singapore. The average price for the month in Singapore of Smoked Sheet, equal to London Standard was 24.8 cents per lb. as compared with 23.53 cents per lb. in July. The average price in London during August was 7.4 pence per lb. and in New York 15.37 cents gold per lb. as compared with 7.03 pence and 14.51 cents gold respectively in July.

Weekly prices paid during August for small-holders' rubber at three centres are shewn in Table I.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, August, 1934.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.					Kuala Kangsar, Perak.				Batu Pahat, Johore.				
	2	9	16	23	30	8	15	22	29	1	8	15	22	29
Smoked sheet		30.35	29.55	30.25	30.00	28.60	29.26	29.21	30.00	25.93			28.16	27.71
Unsmoked sheet	26.74	27.08	26.81	27.35	20.44	25.75	26.20	25.80	26.92	24.85	25.75	26.28	26.74	
Rubber*														
Scrap			15.00				16.52	16.00	14.00					

* Wet unsmoked sheet.

Transport by lorry Kuala Pilah to Seremban 15 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

Palm Oil.—The market continued to improve steadily during the month and its course is shewn in the following table of the Malayan commodity: basis 5 per cent. f.f.a.

Table II.

DATE 1934.	PALM OIL L'Pool/Holland/Hamburg c. i. f. landed weights in bulk per ton £. s. d.	PALM OIL L'Pool/Continent c. i. f. per ton net in barrels £. s. d.	PALM OIL Halifax (Nova Scotia) c. i. f. landed weights per lb. Cents gold.	KERNELS Fair Average Malayan Quality c. i. f. Landed Weight per ton on Continent. £. s. d.
August 2	9 12 6	11 12 6	2.20	6 5 0
„ 8	9 17 6	11 17 6	2.25	6 10 0
„ 15	10 10 0	12 15 0	2.35	6 15 0
„ 22	10 15 0	13 0 0	2.60	7 0 0
„ 29	11 0 0	13 10 0	2.75	7 2 6

Copra.—Singapore prices of copra remained relatively stable during August. The sun-dried grade opened at $2.90 per picul and after rising to $3.10 in the early part of the month, eased again to close at $2.95. The average price for the month was $3 per picul as compared with $2.95 in July. The average price for the mixed quality was $2.40 as against $2.49 in July.

Copra cake continued its upward trend during August closing at $1.70 per picul. The average price for the month was $1.43 per picul.

Rice.—The average wholesale prices of rice per picul during July were as follows:—Siam No. 2 (ordinary) $2.78, Rangoon No. 1 $2.77, Saigon No. 1 (long grain) $2.82 as compared with $2.66, $2.50 and $2.60 respectively in June. Corresponding prices in July 1933 were $3.89, $3.06 and $3.52 respectively.

The average retail market prices in cents per gantang of No. 2 Siam rice in June were:—Singapore 22, Penang 24, Malacca 23 as compared with 21, 25 and 23 respectively in June.

The average declared trade value of imports of rice in July was $2.85 per picul as compared with $2.93 in June and $3.10 in May of this year.

Padi.—The price paid for padi at the Government Rice Mill, Bagan Serai, was advanced 25 cents to $1.50 per picul during the month. Padi prices in Kedah increased from $1.25—$1.40 to $1.70—$1.75 per picul during the period under review. A corresponding rise in the price of rice is reported from the latter State.

Tea.—Tanah Rata (Cameron Highlands) tea was quoted in London during July at 1s. 1d. per lb. and Bigia tea was quoted at 1s. 0¼d. and 11¾d. per lb.

Average London prices per lb. for tea consignments from other countries were as follows:—Ceylon 1s. 0.95d., Java 10.83d., Indian Northern 1s. 0.88d., Indian Southern 1s. 0.53d., Sumatra 10.59d. Prices of all grades continued to decline during the month.

Tuba Root (*Derris*).—There was no change during August in the Singapore market of this commodity, prices continuing at the July average of $34.50 per picul for roots sold on the basis of ether extract and $40 per picul for roots sold on rotenone content.

Additional quotations are:—*D. Elliptica* from Johore and the Federated Malay States, $40 to $45 per picul, and the same species from Changi, Singapore, $60 to $70 per picul.

Coffee.—There was little change in the Singapore prices of coffee in August. Sourabaya opened and closed at $20 to $21 per picul according to grade, but weakened during the month to $19 to $20. Palembang coffee improved from $12 per picul to close at $13.60, averaging $13.32 as compared with $13.12 in July.

Local prices for coffee beans ranged, during the month, from $15 to $24 per picul in various parts of the country.

Arecanuts.—Singapore average prices per picul during August were as follows:—Splits $3.85 to $5.09, Sliced $13 to $16.60, Red Whole $5.20 to $6.10, Sourabaya Whole $6 to $7.10, Kelantan Whole $4.20 to $4.59, the price in each range depending upon quality. No prices were quoted for Bila Whole.

The average prices per picul quoted by the Singapore Chamber of Commerce were:—Best $3.98, Medium $3.48, Mixed $3.15.

Gambier.—Singapore prices continued almost unchanged in August, Block remaining steady at $4 per picul and No. 1 Cube easing slightly to $7.25, with an average of $7.31 as compared with $7.38 in July.

Pineapples.—Prices eased slightly during the month, although at the lower prices no business was passing and sellers were anxious to secure orders. August average prices per case were:—Cubes $3.16, Sliced Flat $3.11, Sliced Tall $3.28 as against $3.19, $3.15 and $3.35 respectively in July.

Prices for fresh fruits in Johore were:—First quality $2—$2.40, second quality $1.50—$2, third quality 80 cents to $1 per hundred.

Prices in Singapore were $2.50 and $1.50 per hundred for first and second quality fruit. In Selangor prices ranged from 70 cents to $3 per hundred according to quality.

Tapioca.—Prices in Singapore during August continued at the July level with the exception of Flake Fair which declined still further to average $3.73 per picul as compared with $3.94 in July. The price of Pearl Seed was $5.75 per picul and of Pearl Medium $6 per picul.

Sago.—Singapore prices rose slightly in August, averaging $3.95 per picul for Pearl, Small Fair, and $1.89 for Flour, Sarawak Fair as compared with $3.84 and $1.85 respectively in July.

Mace.—The Singapore market improved considerably during August, the price for Siouw rising to $80 per picul throughout the month, and for Amboina to $54 per picul at the beginning of August. The latter price fell away again, however, to its old level of $50 per picul, giving an average of $51 for the month.

Nutmegs.—Singapore prices remained steady throughout the month at the July closing level of $24 per picul for 110's and $25 per picul for 80's. Average prices for July were $23.25 and $24.25 respectively.

Pepper.—Prices advanced during the month, chiefly owing, it is thought, to buying of a speculative nature. Average prices per picul in Singapore were:—Singapore Black $13.69, Singapore White $36 63, Muntok White $37.69 as compared with July averages of $13.31, $31.63 and $33.12 respectively.

Cloves.—Prices in Singapore continued nominal at Zanzibar $35 and Amboina $45 per picul.

Tobacco: Prices of sun dried leaves ranged, in most parts of the country, from $6 to $60 per picul, according to quality. The price range in Kelantan was from $40 to $45, and in Johore from $40 to $80 per picul.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Mackay & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY

July 1934.

Malaya.—Imports of foreign rice into Malaya during July were 55,463 tons, and exports 13,838 tons, net imports accordingly being 41,625 tons. Net imports for the period January to July 1934 were 262,917 tons, an increase of 10.4 per cent. over the corresponding period in 1933.

Of the imports during July, 53 per cent. were consigned to Singapore, 17 per cent. to Penang, 6 per cent. to Malacca, 17 per cent. to the Federated Malay States and 7 per cent. to the Unfederated Malay States. Of the total, 71 per cent. came from Siam, 25 per cent. from Burma, 3 per cent. from French Indo-China and 1 per cent. from other countries.

Of the exports during the month under review, 65 per cent. were shipped to Netherlands India, and 35 per cent. to other countries. The various kinds of rice exported were:—Siam 8,465 tons (61.2 per cent.), Burma 4,298 tons (31 per cent.), French Indo-China 346 tons (2.5 per cent.), India 636 tons (4.6 per cent.) local production 93 tons (0.7 per cent.).

India and Burma.—Foreign exports for the period January to May, 1934 totalled 814,000 tons, a decrease of 14.7 per cent. as compared with exports of 954,000 tons for the corresponding period of 1933.

The total exports of rice and bran from Burma for the six months 1st January to 30th June 1934 were 2,349,799 metric tons as compared with 2,062,703 metric tons for the same period in 1933, an increase of 13.9 per cent.

Siam.—Exports of rice from Bangkok in June were 109,308 tons, giving a total of 849,487 tons for the half year as compared with 828,020 tons for the first six months of 1933.

Japan.—According to the Ministry for Agriculture and Forestry, stocks of rice in Japan Proper on 1st July 1934, totalled 4,975,520 tons, an increase of 1,121,710 tons or 29 per cent. as compared with the corresponding period in 1933.

The supply and demand for the period 1st July to 31st October 1934, is estimated as follows:—

Supply:	Stocks on 1st July	...	4,975,520 tons.
	Imports of Korean rice	...	238,430 „
	Imports of Formosan rice	...	280,500 „
Demand:	Consumption (July/October)	...	3,178,960 „
	Exports	...	21,040 „

shewing a surplus of 2,294,450 tons.

It is stated (*Trans Pacific Journal* 26th July, 1934) that most of the 2,103,790 tons of rice held by the Government would deteriorate if the inclement weather continued and that if the weather did not improve in August, the outlook would be serious for this year's crop. In 1911 when similar weather prevailed, there was famine in Akita and Yamagata Prefectures and

as this year the bad weather has covered the greater part of Japan, the situation is considered far more serious than in 1911.

French Indo-China.—Entries of padi into Cholon, January to July 1934 totalled 942,854 metric tons as compared with 771,585 metric tons during the corresponding period of 1933 an increase of 22.2 per cent. Exports of rice for the same period this year were 905,004 metric tons, an increase of 4.6 per cent. as compared with exports of 865,047 metric tons during the corresponding period of 1933.

Netherlands India.—Imports of rice for the period January to May 1934, (*Economic Bulletin* dated 1st August, 1934) amounted to 72,836 metric tons, a decrease of 66 per cent. as compared with the imports during the same period of 1933, totalling 214,420 metric tons.

Ceylon.—The imports for the first seven months of 1934, were 277,911 tons an increase of 9.7 per cent. as compared with 253,370 tons for the corresponding period of 1933. Of the 1934 imports, 14 per cent. were from British India, 64 per cent. from Burma and 22 per cent. from other countries.

Europe and America.—Shipments to Europe from the East were 814,459 tons for the period 1st January to 19th July, 1934, as compared with 834,109 tons for the corresponding period of 1933, a decrease of 2.4 per cent.

Of the 1934 shipments. 41 per cent. were from Burma, 5 per cent. from Japan, 43 per cent. from Saigon, 9 per cent. from Siam, and 2 per cent. from Bengal. The corresponding percentages for 1933, were 52, 3 , 38, 6 and 1 per cent. respectively.

Shipments to the Levant from the East during the period 1st January to 25th June, 1934, were 20,335 tons as compared with 17,121 tons for the same period in 1933, an increase of 18.8 per cent.

Shipments to the West Indies and America for the period 1st January to 24th June. 1934, were 109,550 tons as compared with 83,968 tons during the corresponding period in 1933, an increase of 30.5 per cent.

MALAYAN AGRICULTURAL EXPORTS, JULY, 1934.

PRODUCT.	Net Export in Tons.				
	Year 1933.	Jan.-July 1933.	Jan.-July 1934.	July 1933.	July 1934.
Arecanuts ...	20,756	11,921	19,594	1,308	2,344
Coconuts, fresh† ...	100,609†	59,536†	58,227†	10,742†	12,532†
Coconut oil ...	17,568	10,507	14,509	1,064	1,926
Copra ...	110,543	46,626	54,302	7,531	9,475
Gambier, all kinds ...	2,560	1,361	1,239	144	197
Oil cakes ...	9,992	6,531	7,108	518	917
Palm kernels ...	1,983	962	1,664	170	319
Palm oil ...	12,101	4,923	7,388	830	1,159
Pineapples canned ...	59,582	40.358	48,382	7,684	8,825
Rubber§ ...	459,836§	251,402	238,619§	42,655§	31,079§
Sago,—flour ...	7,648	3,317	3,988	1,383	258*
,, —pearl ...	2,646	1,220	2,588	171	465
,, —raw ...	4,420*	2,430*	3,544*	393*	645*
Tapioca,—flake ...	9,881	6,669	4,434	661	320
,, —flour ...	702*	128*	1,255*	13	17*
,, —pearl ...	17,297	9,511	9,382	1,536	1,441
Tuba root ...	569½	270½	348½	39½	51½

† hundreds in number. * net imports. § production.

MALAYA RUBBER STATISTICS

Acreages of Tappable Rubber not Tapped on Estates of 100 Acres and over, for the Month ending July, 1934.

State or Territory	Acreage of Tappable Rubber end 1933 (d)	Estates which have entirely ceased tapping		Estates which have partly ceased tapping (a)		Area of Tappable Rubber never been tapped		Total (3) + (5)	Percentage of (9) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Straits Settlements :—									
Province Wellesley	44,285	1,127	2.5	8,288	18.7	622	1.4	9,415	21.2
Dindings	7,368	112	1.5	918	12.5	158	2.1	1,030	14.0
Malacca	121,152	1,415	1.2	16,765	13.8	3,271	2.7	18,180	15.0
Penang Island	1,366	318	23.3	311	22.7	145	10.6	629	46.0
Singapore Island	28,842	4,831	16.7	3,927	13.6	716	2.5	8,758	30.3
Total S.S. ...	203,013	7,803	3.8	30,209	14.9	4,912	2.4	38,012	18.7
Federated Malay States :—									
Perak	253,227	4,647	1.8	36,217	14.3	12,132	4.8	40,864	16.1
Selangor	310,003	3,291	1.1	43,525	14.0	12,174	3.9	46,816	15.1
Negri Sembilan	233,592	7,463	3.2	34,897	14.9	19,306	8.3	42,360	18.1
Pahang	46,712	1,747	3.7	12,070	25.8	6,289	13.5	13,817	29.5
Total F.M.S. ...	843,534	17,148	2.0	126,709	15.0	49,901	5.9	143,857	17.0
Unfederated Malay States :—									
Johore	(b) 325,747	12,721	3.9	23,559	7.2	22,300	6.8	36,280	11.1
Kedah (c)	126,588	4,194	3.3	27,011	21.3	17,429	13.8	31,205	24.6
Kelantan	25,793	4,716	18.3	2,719	10.5	3,941	15.3	7,435	28.8
Trengganu (c)	4,543	Nil	Nil	171	3.8	171	3.8	171	3.8
Perlis (d)	1,181	Nil	Nil	266	22.5	Nil	Nil	266	22.5
Total U.M.S. ...	483,852	21,631	4.5	53,726	11.1	43,841	9.1	75,357	15.6
Total Malaya ...	1,530,399	46,582	3.0	210,644	13.8	98,654	6.4	257,226	16.8

Notes :—(a) Area out of tapping on Estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(b) Figures are for end December, 1932.

(c) Registered Companies only.

(d) Rendered quarterly.

(e) Figures are as reported by estate managers.

N.B.—In returns from April, 1934, inclusive, column (7) has been included in columns (3) and (5) and the figures in the above summary for the period January to March inclusive have been amended accordingly.

MALAYA RUBBER STATISTICS TABLE I

Stocks, Production, Imports and Exports of Rubber, including Latex, Concentrated Latex and Revertex, for the Month of June, 1934 in Dry Tons.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
	Ports	Dealer	Estates of 100 acres and over	during the month	January to July inclusive 1934	during the month	January to July inclusive 1934	during the month: Foreign	during the month: From Malay States & Labuan	January to May inclusive 1934: Foreign	January to May inclusive 1934: From Malay States & Labuan	during the month: Foreign	during the month: Local	January to May inclusive 1934: Foreign	January to May inclusive 1934: Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Malay States :—																		
Federated Malay States ...	...	5,133	7,840	13,359	81,647	4,842	61,545	Nil	Nil	Nil	Nil	10,584	1,950	105,849	52,294	...	9,752	8,869
Johore ...	...	1,113	2,416	3,847	25,911	3,645	30,459	Nil	120	Nil	268	1,275	5,671	11,353	47,577	...	1,914	2,281
Kedah ...	...	289	1,674	2,814	19,186	1,348	10,627	Nil	Nil	Nil	Nil	1,620	2,186	10,326	20,000	...	349	1,970
Perlis ...	...	30	13	18	98	40	255	Nil	Nil	Nil	Nil	Nil	50	Nil	345	...	41	10
Kelantan ...	...	130	138	247	1,599	436	4,915	Nil	Nil	319	Nil	79	554	633	6,300	...	150	168
Trengganu ...	...	55	50	282	1,586	141	791	Nil	Nil	Nil	Nil	Nil	423	Ni	2,377	...	55	50
Total Malay States	...	6,750	12,131	20,567	130,027	10,452	108.592	Nil	120	319	268	13,558	10.834	128,161	128.893	...	12,261	13,348
Straits Settlements :-																		
Malacca ...	...	1,051	672	1,418	9,330	1,232		Nil		4		2,341		23,735		...	2,260	803
Province Wellesley	...	136	448	598	4,060	202		Nil		Nil						...	1,054	490
Dindings ...	...	42	77	118	755	54	16.325	Nil	11.871	Nil	119.361		Nil		Nil	...	26	138
Penang ...	2,990	14,880	7	15	86	64		3,573		16.893		7,307		57,657		2,854	14,476	13
Singapore ...	7,554	55,149	158	170	1,240	79		19,256		124,304		31,884		196,356		5,070	50,623	128
Total Straits Settlements	10,544	71,258	1,362	2,319	15,471	1,631	16,325	22,829	11,871	141.201	119.361	41,532	Nil	277.748	Nil	7,924	68,439	1,572
Total Malaya	10,544	78,008	13,493	22,886	145 498	12,083	124.917	22,829	11,991	141,520	119,629	55,090	10,834	405,909	128,893	7,924	80,700	14,920

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
20	21	22	28	24	25	26
Dry Rubber	8,682	41,361	10.783	3,289	1.343	215
Wet Rubber	1.070	9,262	3,693	51	571	134
Total ...	9.752	50.623	14.476	3.340	1,914	349

TABLE III
FOREIGN EXPORTS

PORTS	For month	January to July 1934
Singapore ...	40.108	273.800
Penang ...	10.902	88.468
Port Swettenham.	3.677	39.433
Malacca ...	403	4,208
Malaya ...	55.090	405.909

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January to July 1934
Malay States ...	24.205	243,007
Straits Settlements	3.116	
Malaya ...	27,321	243.307

Notes :— 1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, *i.e.*, Column (9) = Columns (15) + (16) + (19) + (20) + (21) + (22) −(4)−(5)−(6)−(7)−(11)−(12). For the Straits Settlements. Columns (9) figures for Singapore and Penang Islands represent sales or exports as shown by cess paid and for the mainland represent as previously purchases by dealers from local estates of less than 100 acres, reduced by 15 % to terms of dry rubber.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.

4. Domestic exports are reported by the Customs Authorities for the Malay States and by the Registrars of Imports and Exports for Province Wellesley, Malacca, Dindings and Labuan. For Singapore and Penang Island domestic exports are represented by sales or exports of rubber as shown by cess paid.

METEOROLOGICAL SUMMARY, MALAYA, JULY, 1934.

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B.	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total.	Total.	Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.								
Railway Hill, Kuala Lumpur, Selangor ...	90.6	71.7	81.1	94	68	85	74	84.2	84.9	4.28	108.7	1.21	15	14	3	2		210.85	6.80	55
Bukit Jeram, Selangor ...	88.3	72.3	80.3	92	70	85	75	83.8	85.6	5.41	137.4	1.43	13	9	2		1	242.50	7.82	63
Sitiawan, Perak ...	90.7	72.8	81.7	94	70	86	75	84.4	85.2	1.55	39.4	0.75	8	3				201.40	6.50	53
Temerloh, Pahang ...	89.6	72.4	81.0	93	70	84	75	85.0	86.0	6.09	154.7	3.99	14	10	1	5		205.60	6.63	54
Kuala Lipis, Pahang ...	88.8	72.1	80.5	92	69	81	74	84.0	84.9	4.84	122.9	2.30	8	7		20		188.35	6.08	49
Kuala Pahang, Pahang ...	87.0	74.4	80.7	90	71	82	77	85.6	86.0	6.55	166.4	1.59	15	14				238.35	7.69	63
Kallang Aerodrome, S'pore ...	86.4	76.5	81.5	90	71	81	80	81.7	82.9	10.19	258.8	2.00	15	13	4			190.85	6.16	
Butterworth, Province Wellesley ...	87.3	74.2	80.8	90	72	84	77	83.7	84.7	6.54	166.1	1.23	14	11	6			168.40	5.45	44
Bukit China, Malacca ...	84.8	73.8	79.3	87	70	79	77	83.1	83.9	9.83	249.7	3.16	10	10	2	1		214.45	6.92	57
Kluang, Johore ...	87.4	70.9	79.1	91	69	81	73	81.4	81.9	3.11	79.0	0.73	20	10		8		172.70	5.57	46
Bukit Lalang, Mersing, Johore	86.6	72.5	79.5	89	71	83	75	81.7	82.0	4.91	124.7	1.00	18	13	1	2		196.30	6.33	52
Alor Star, Kedah ...	87.4	74.2	80.8	92	72	81	77	86.5	86.4	12.36	313.9	2.93	21	16	5	1	2	182.90	5.90	48
Kota Bahru, Kelantan ...	89.2	73.6	81.4	93	71	79	77	84.8	85.2	8.57	217.7	2.59	14	12	4			218.35	7.04	57
Kuala Trengganu, Trengganu	88.5	73.4	80.9	91	70	79	75	83.7	84.8	6.30	160.0	3.51	15	10	3	1		221.10	7.13	57
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. Pahang ...	74.2	62.5	68.3	78	60	69	64	71.3	71.9	3.61	91.7	1.49	12	10	2	3	1	181.95	5.87	48
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	72.5	55.6	64.1	76	48	69	62	70.1	69.7	3.49	88.7	1.17	15	10	1			130.10	4.20	34
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	71.7	59.4	65.5	75	55	68	61			4.02	102.1	1.41	16	9				138.70	4.47	36

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The Agricultural Economist.

THE

Malayan Agricultural Journal.

OCTOBER, 1934.

EDITORIAL.

Malayan Soil Studies.

The fourth part of the series of Malayan Soil Studies, which is included in the present number, gives an account of field experiments conducted on quartzite valley soil which in the recent past had been under swamp conditions. The soil, which is fortunately not typical of any extensive areas in Malaya, is, however, such as is not infrequently occupied by Chinese squatters who mainly grow sweet potatoes and the like as food for pigs.

In the present instance, the land had proved absolutely infertile for rapidly-growing food or cover crops, although previously, after efficient drainage, it had supported crops of tapioca and derris and fibre plants.

The results of the present series of experiments shew that on such soil the application of artificial fertilizers produces no economic improvement in fertility, but that farmyard manure makes the production of short-term food crops possible, although even in such cases, yields are of a low order.

The substitution of green organic dressings for farmyard manure suggested itself in view of the difficulty of obtaining the latter in large quantities. Experiment proved, however, that such green dressings could not be relied on to give results equal to those given by farmyard manure, even with the addition of artificial fertilizers.

Malayan Rubber Statistics.

The review of statistics concerning the areas and production of rubber in Malaya in 1933, which will be found in this issue, is designed to present in concise form the position of the industry at the end of 1933. Accuracy on such a subject is an impossibility—the most that can be expected is an approximation to the truth. It is an undoubted fact, however, that the annual statistics have shewn constant improvement, especially in respect of an extension of the information obtained. For this result, the organisation of the Statistics Department and the liaison between the Departments of Agriculture and Statistics, are responsible, but one must also acknowledge the assistance of owners and managers of estates for the more prompt presentation of their returns.

The advent of the scheme of Rubber Regulation introduces a new phase in the compilation of statistics. The new organisation will be in possession of more complete data from individual estates and small holdings than has hitherto been available. The close collaboration of the Statistics Department with the work of the Controller of Rubber has suggested itself and it is hoped as a result, that more complete statistics than have hitherto been possible, respecting the year 1934, will become available early in 1935.

Rubber Control in the Netherlands Indies. An important abstract has been taken from this number at the last moment to make room for an abstract of the Nineteenth Report on Native Rubber Cultivation in the Netherlands Indies. In view of the introduction of control of rubber, and of the importance in this connexion of the position of rubber production in the Netherlands Indies, this authoritative report is of great interest. The full report, in English, will be found in the *Economic Bulletin of Netherlands India* published September 17, 1934.

One of the most significant results of the method adopted in the Netherlands Indies for the control of rubber exports is a decided improvement in methods of preparation of the product. This improvement may be to the disadvantage of certain interests, but it cannot be denied that it is to the advantage of the country of production and of the rubber industry as a whole. Hitherto, the native rubber from the Netherlands Indies has been vastly inferior to that produced on small holdings in Malaya. It is to be expected that although the recent improvements were dictated by the conditions arising as a result of restriction, they will prove to be of a permanent nature. In the meantime, the quality of rubber produced by small-holders in Malaya shews still further improvements—the result, very largely, of propaganda.

These developments must be welcome to the administrations of the countries concerned, for not only is it of advantage to the rubber industry as a whole that a high product should be marketed, but it is reflected in the well-being of the small producer, who receives an enhanced price for his product.

Original Articles.

STUDIES IN MALAYAN SOILS.*

Part IV. Experiments on the Conditioning of an Infertile Soil.

BY

J. LAMBOURNE,

Assistant Agriculturist.

In Part II (*Malayan Agricultural Journal* Vol. XXI, October 1933, p. 471) of the Series, a description was given of small-scale pot and field experiments on a dark coloured quartzite valley soil which showed specific effects from the application of cattle manure. This manure, even in small applications which supplied nutrients in amount equal to those contained in normal dressings of artificial fertilizers, gave results markedly better than artificials. The soil on which these experiments were conducted was representative of a not inconsiderable area of flat land at the Central Experiment Station, Serdang, which in the past has been unsatisfactory with short-term food crops. Certain parts of the area exhibit the undesirable characters mentioned by Dennett (*Malayan Agricultural Journal*, Vol. XXI, p. 356) as likely to be found in valley soils of quartzite formation, *viz.* occurrence of free carbon and of sulphur-rich shales: others have shallow soil overlying a deep subsoil of exceedingly fine, closely packed sand, but considerable portions exhibit no obviously undesirable characters. The physical analysis of the soil is good, indicating clay or sandy loams and in chemical composition the soil is up to the average of quartzite hill soils.

Table I.
Analysis of Soil from Block 30, Serdang.

CHEMICAL		MECHANICAL	
	Per cent.		Per cent.
Moisture	5.2	Gravel	nil
Loss on ignition	7.5		
Carbon	1.53	Coarse sand	17.0
Nitrogen	0.087		
Lime	0.054	Fine sand	29.0
Iron and aluminium oxides	17.4	Silt	10.0
Potash (K_2O)	0.256		
Phosphoric acid (as P_2O_5)	0.027	Clay	44.0
Magnesia	0.051	pH value	5.0

* Parts I, II and III of this article appeared in *The Malayan Agricultural Journal*, Vol. XXI, Nos. 8 and 10 and Vol. XXII, No. 1 respectively.

When this part of the Plantation was opened up in 1923 the low-lying area was under light jungle and was swampy in wet weather, water up to three feet being encountered. It was noticed that the light jungle was of a peculiar nature containing many trees with stilt roots. No large trees were encountered, but as this is a mining district large timber of value may have been previously removed. The area might be described as supporting a swamp flora and many species were noted as occurring in similar situations elsewhere. Efficient drainage was provided at an early date.

Early cropping of the central part of the area with which we are here concerned gave no indication of infertility, but such planting was of fibre crops, derris, and tapioca and not of crops such as maize, tobacco and leguminous covers. It is not to be anticipated that one or two crops of fibre or derris could exhaust soil so completely as to inhibit growth, and evidence to the contrary is provided by tapioca which exhibited only a normal falling off of yield from 1924 to 1929. It is to be emphasised that when maize and similar crops are planted there is not merely poor growth, but practically complete absence of growth.

A number of field experiments have been carried out on this area since 1931, which may conveniently be grouped under four heads, *viz.*—

A. Manurial trials with maize and tobacco.
B. Green organic dressings experiment.
C. Green organic dressings experiment plus artificial fertilizer.
D. Soil reconditioning experiments with farmyard manure, lime, artificial fertilizers and green dressings.

Of these, A and D were suggested and the lay-out planned by the Director of Agriculture (Dr. H. A. Tempany, C.B.E.), while B and C were planned by the Chief Research Officer (Mr. W. N. C. Belgrave). Actual field supervision and reporting were carried out by Messrs. J. N. Milsum and J. L. Greig for the first year of series A and D. The remainder of the work was carried out by the writer.

Series A. Block 24. Manurial trials with Tobacco and Maize.

History of the Block.—After clean clearing in 1923 the land was tractor-cultivated and planted with Caraguata fibre which remained until 1928. Growth was good; no manure was applied. Tapioca was planted after ploughing in December 1928, and yields were below normal. This crop was removed in December 1929, the land remaining fallow and bare for ten months. Maize preceded by a dressing of 40 lbs. urea per acre was then planted, but failed completely.

Experiment I. Plots of 1/16th. acre were laid out to give four replications each of three treatments and a control; eight of the plots were planted with maize and eight with tobacco in April, 1931.

Controls		Received no manure.
N.P.K.*	=	Nitrogen, phosphate, and potash.
F.Y.M. + N.P.K.	=	Farmyard manure plus nitrogen, phosphate and potash.
F.Y.M.	=	Farmyard manure.

The farmyard manure was applied at the rate of 20 tons per acre and the complete mixture (N.P.K.) was made up as follows:—

Sulphate of ammonia 20 per cent. N.	...	300 lbs. per acre.
Superphosphate 18/20 per cent. P_2O_5	...	200 „
Sulphate of potash 48 per cent. K_2O	...	100 „

The whole of the farmyard manure and half the artificials were applied before planting and the other half of the latter, three weeks after planting.

The maize germinated evenly over the plots and the tobacco plants appeared well established. After two months the plants to which F.Y.M. had been applied both with and without artificials had produced good growth of both maize and tobacco; those to which artificials only had been applied showed poor growth and no crop was obtained from either maize or tobacco, and in the case of the control the plants turned yellow and died when a few inches high.

Plates I and II show the appearance of the maize plots seven weeks after planting.

Table II.

Yield of Maize and Tobacco Leaf in 1931. Calculated to lbs. per acre on the Means of two Plots.

Treatment	Maize lbs.	Tobacco Green Leaf lbs.
Control ...	—	—
N.P.K. ...	—	—
F.Y.M. with N.P.K. ...	485	3,686
F.Y.M. ...	428	3,370

Experiment II.—To ascertain whether any residual effect existed from the previous application of manures, the experiment was repeated on the same plots in April, 1932, after about eight months fallow. Each of the plots mentioned above was divided into two, one half in each case receiving similar treatment

* For the sake of brevity the initials N.P.K. are used throughout the article for Nitrogen, Phosphate and Potash, and F.Y.M. for Farmyard Manure.

to that previously given, with the difference that nitrogen and phosphoric acid were applied as calcium cyanamide and basic slag while the other half received no further treatment beyond cultivation. The change in form of the manure was due to information gained in the course of work by the Soils Division and described in Part II of this Series.

The actual mixture of artificials applied in this case was as follows:—

Calcium cyanamide	...	200 lbs. per acre.
Basic slag	...	225 „
Sulphate of potash	...	100 „

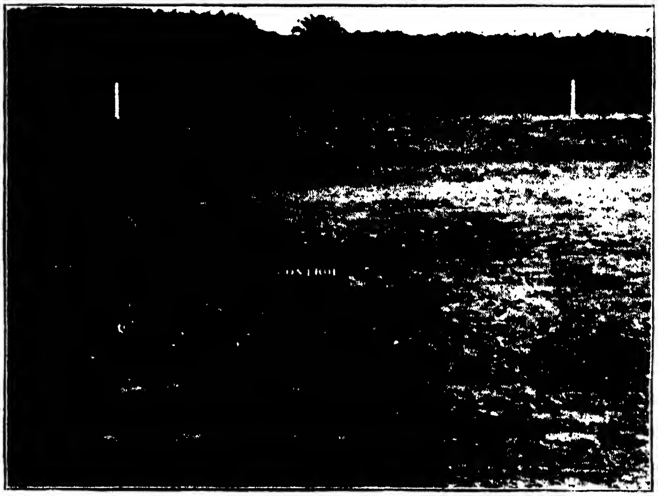
The whole of the farmyard manure and half the artificials were applied before planting and the other half of the latter, three weeks after planting.

Table III.

Yield of Maize and Tobacco Leaf in 1931. Calculated to lbs. per acre on the Means of two Sub-plots.

Treatments	Yield of Maize lbs.	Yield of Green Tobacco Leaf lbs.
	Residues 1931 manures.	
Controls ...	4	—
Artificials only ...	44	176
Artificials + Farmyard Manure ...	704	1,984
Farmyard Manure ...	768	2,032
	Residues from 1931 + Manures 1932.	
Control ...	8	—
Artificials only ...	208	2,400
Farmyard Manure + Artificials ...	1,472	4,848
Farmyard Manure ...	1,600	3,920

Discussion of Results.—From Table II it will be seen that on this type of soil after some years cropping, neither maize nor tobacco can be grown even with the addition of a complete mixture of artificial fertilizer. On the other hand, dressings of farmyard manure enable reasonable crops to be obtained which are not greatly increased by addition of artificials to the farmyard manure.



Maize. Control Plot.

Maize. Artificial Manure Plot.

PLATE II.

MAIZE. F. Y. M. PLOT.

MAIZE. F.Y.M. AND ARTIFICIALS PLOT.

It must, of course, be borne in mind that the actual quantities of nutrients added are not comparable; the artificial mixture used supplied approximately 60 lbs. nitrogen, 38 lbs. phosphoric acid (as P_2O_5) and 48 lbs. potash (as K_2O) while the farmyard manure supplied approximately 270 lbs. nitrogen, 450 lbs. phosphoric acid and 135 lbs. potash of which, under tropical conditions, a large part may be expected to be readily available.

Table III shows that there was considerable residual effect from farmyard manure and that the use of "basic" artificials resulted in the production of a fair crop of tobacco and some growth of maize. In Part II of the Series it has been shown that better results from "basic" manures are not peculiar to these valley soils, but extend to quartzite hill soils as well.

Series B. Green Organic Dressings Experiments.

The main conclusion arrived at as the result of the previous experiment is of limited practical application in Malaya, as in the majority of cases sufficient supplies of farmyard manure are unobtainable. It is possible that in certain States, notably Kedah and Kelantan where cattle rearing is more extensively practised, a solution might be found by organising the production of cattle manure on lines practised, for example, in Mauritius and some of the West Indian Islands, but in the generality of cases this is not feasible.

Accordingly, a further series of experiments was undertaken in order to ascertain to what extent the incorporation of organic matter in the soil could be successfully substituted for the use of farmyard manure in the process of soil rejuvenation.

Soil.—The area used for this experiment is in a ten acre block contiguous to that on which the manurial experiment described above was carried out. The soil on the whole is heavier, having from 50 to 60 per cent. fine fractions, and may be described as a dark clay loam.

History of the Block.—The history of the block is approximately similar to that on which the A series of experiments was carried out. It was opened at the same time, and was first planted in 1924 with sisal hemp, *Agave rigida* var. *sisalana*. By 1930 it had become unproductive and lay fallow from September, 1930 until December, 1931; in the latter month it was ploughed and then allowed to remain fallow again until April, 1932, when a cover crop (*Mikania scandens*) was planted with a small dressing of basic slag. This crop took root, but made very little growth and the area remained fallow, covered mainly with a poor growth of grass until the experiment to be described below was laid out.

Lay-out of the Experiment.

The area employed in this experiment comprises two acres divided into forty 1/20th. acre plots arranged in four blocks A—D of ten plots tach; the following treatments were randomised in each series:—

Treatment

No. 1. *Centrosema pubescens* dug in green six weeks before planting.
2. Centrosema dug in green three weeks before planting.
3. Centrosema dug in green one week before planting.
4. Cut grass dug in green six weeks before planting.
5. Cut grass dug in green three weeks before planting.
6. Cut grass dug in green one week before planting.
7. Centrosema laid on surface five weeks and dug in one week before planting.
8. Centrosema laid on surface two weeks and dug in one week before planting.
9. Cut grass laid on surface five weeks and dug in one week before planting.
10. Cut grass laid on surface two weeks and dug in one week before planting.

The different treatments were designed to test points which had arisen in the course of pot culture work described in Part II and III of this Series.

The *Centrosema pubescens* was obtained from other parts of the Station, and the cut grass from road sides. These green materials were applied to the plots at the rate of fifteen tons per acre.

Maize (var. Native Flint) was grown in the plots, the seeds being planted two per hole (21 lbs. per acre) at a distance of 15 inches in rows two feet apart.

The seeds germinated evenly, but subsequent growth was uneven and the majority of the plants turned yellow at the edges of the leaves; there were patches, however, in most of the plots where the seedlings grew normally. Wet weather was prevalent during the early growth of the plants and this may have affected them adversely, although drainage was good.

To save the plants from dying, it was decided to give a dressing of artificial manures to all the plots. The following mixture was applied between the rows and raked into the soil four weeks after planting: calcium cyanamide 1 cwt., basic slag 3 cwts., and sulphate of potash ¾ cwt. per acre.

The effect of the fertilizers was apparent in about a fortnight after their application, by which time the plants had a more healthy colour and commenced to grow with more vigour, although growth remained uneven in all the plots up to the time of harvest at the end of January, 1933.

The yields of maize are given in Table IV and will be discussed later.

Table IV.

Calculated Yields per acre Clean Maize.
Plots 1/20th acre.

Treatment	Block A.	Block B.	Block C.	Block D.	Means
	lbs.	lbs.	lbs.	lbs.	lbs.
1	165	120	480	220	246
2	235	300	440	80	264
3	360	440	360	320	370
4	40	520	560	520	410
5	240	420	200	120	245
6	340	540	480	510	468
7	760	420	360	200	435
8	160	500	480	540	420
9	300	80	80	620	270
10	260	320	80	260	230
Means	286	366	352	339	336 General Mean

The proportion of trash to maize was of the same order throughout.

The plots used in this experiment were subsequently ploughed in April, 1933, to turn in the grasses and weeds that had appeared in the plots after the maize was harvested. A dressing of basic slag at the rate of 2 cwts. per acre was applied to all the plots, and cow peas were planted on the 11th May, 1933, the sowing being at the rate of 21 lbs. per acre. The seeds germinated in a few days and grew fairly evenly on all the plots. Aphis attacked the plants when they were about 6 inches in height, but were controlled by spraying with kerosene emulsion. Two months after planting, the cow peas had made excellent growth on all the plots, irrespective of earlier treatment, but the crop of seeds was poor owing to the fact that a disease developed in the pods before they were ripe and caused considerable damage; rats were also troublesome. The yields of cow pea seeds are given in Table V, and from these figures it will be seen that there is considerable variation in yield of seeds from the different plots. The difference between the lowest-yielding plots: Centrosema dug in three weeks before planting, and the highest: cut grass laid on the surface five weeks and dug in one week before planting, is however, not significant because, on statistical examination, it has been found that a difference in yield of 114 lbs. of seed per acre between any two plots is required for significance.

Table V.
Calculated Yields per Acre. Each plot—1/20th. acre.
Cow Pea.

Treatment	Block A.	Block B.	Block C.	Block D.	Means
	lbs.	lbs.	lbs.	lbs.	lbs.
1	225	129	63	43	123
2	190	100	23	45	90
3	323	189	43	1	139
4	143	118	43	81	96
5	383	70	63	23	135
6	351	230	67	41	172
7	280	107	163	5	139
8	141	150	33	183	127
9	414	200	41	43	175
10	207	121	120	107	139
Means	269	141	66	57	134 General Mean

Difference between treatments required for significance = 114 lbs. per acre.

Discussion of Results.

The maize crop results were analysed by the Chief Research Officer and his comments are as follows:—

"Application of statistical method is scarcely fair in this experiment since growth was excessively uneven in any one plot. However, for what it is worth analysis gives a significant "Z" value and standard deviation of 115 lbs., roughly 30 per cent. of the mean, from which it follows that the smallest significant difference between any pair is 200 lbs."

"The average yields of maize from the different treatments arranged in order of merit are as follows:—

Treatment		lbs. per acre.
No. 6.	Grass dug in green one week before planting ...	468
7.	*Centrosema pubescens* laid down on the surface five weeks and dug in one week before planting	435
8.	*Centrosema pubescens* laid on the surface two weeks and dug in one week before planting ...	420
4.	Grass dug in green six weeks before planting ...	410
3.	*Centrosema pubescens* dug in one week before planting ...	345

2.	*Centrosema pubescens* dug in three weeks before planting ...	264
1.	*Centrosema pubescens* dug in six weeks before planting ...	246
5.	Grass dug in three weeks before planting ...	245
10.	Grass laid on the surface two weeks and dug in one week before planting ...	230
9.	Grass laid on the surface five weeks and dug in one week before planting ...	220

"All that can be said with any degree of assurance is that the first five treatments, 3, 4, 6, 7 and 8 appear definitely better than the other five. The exclusion of the worst plot in each case does not appreciably alter the order of merit".

"Apart from the apparently aberrant case of No. 5, grass buried for three weeks before planting, it would appear that grass laid on the surface is useless, while Centrosema benefits by that treatment; further, Centrosema is useless if buried too long before planting. These apparently conflicting facts may be connected with the difference in nitrogen content, Centrosema containing approximately three times more nitrogen than does grass".

"The experiment was further complicated by the necessity for a top dressing of complete fertilizers to save the plants".

The yield of cow pea seeds was poor, but the growth of the crop was excellent.

Series C. Green Organic Dressings Experiment, plus Artificial Fertilizers.

This experiment follows as a natural sequence to the one described above and supplements it essentially by the application of different mixtures of artificial manures before sowing.

Soil.—The soil is a fairly even clay with 50 to 60 per cent. fine fractions.

History of the Area.—After being cleared of jungle in 1923 the area was cultivated with a tractor-plough. Tapioca was planted in November, 1924, and harvested in April, 1926. Horse gram, *Dolichos biflorus* was sown immediately afterwards on half the area; the other half received no treatment beyond the same cultivation. The horse gram was turned in during December, 1926, and a second crop of tapioca planted. This treatment was repeated and a third crop of tapioca planted which was harvested in 1929. Thereafter until April, 1933, the land lay fallow when the present experiment was laid out.

Lay-out of Experiment.

The area was divided into sixteen plots of one-tenth acre each arranged in a Latin Square. The treatments were as follows:—

A. *Centrosema pubescens* turned in green six weeks before planting.
B. *Centrosema pubescens* turned in green one week before planting.
C. *Centrosema pubescens* laid on the surface for five weeks and turned in one week before planting.

D. Grass cuttings turned in green one week before planting.

These green dressings were applied at the rate of 15 tons per acre commencing on the 18th April, 1933.

Each of the plots to which green dressings had been applied was divided into four sub-plots of 1/40th. acre and received supplementary dressings of artificials treated as follows :—

1. Phosphorus as basic slag: 2 cwts. per acre.
2. Basic slag as in 1 + N as calcium cyanide: 1 cwt. per acre.
3. Basic slag as in 1 + potash as sulphate: ½ cwt. per acre.
4. Phosphorus and nitrogen as in 2 + potash as sulphate: ½ cwt. per acre.

Treatments were randomised and the artificial manures were applied one week before sowing gingelly. The seeds were sown on the 2nd and 5th June, 1933, in rows eighteen inches apart.

Owing to drought, growth was uneven and subsequently the plants were attacked with disease.

Discussion of Results.

The mean yields of gingelly seeds are given in Table VI. These figures have been examined statistically and differences found to be without significance. A difference of 80 lbs. per acre would be required in sub-plot means and this does not occur. These results do not confirm those of series B, but dry weather conditions, or the fact that the crop was different, may be responsible.

Table VI.

Organic Dressings Experiment with Manures.
Calculated Yields per acre of Gingelly Seeds.
Means of four Sub-plots.

Plot Nos.	1 P. lbs.	2 N.P. lbs.	3 P.K. lbs.	4 N.P.K. lbs.	Means lbs.
A	167.5	192.5	175.0	197.5	183
B	170.0	215.0	127.5	205.0	179
C	162.5	160.0	152.5	170.0	161
D	97.5	135.0	122.5	142.5	124
Means	149.4	175.6	144.4	178.7	162 General Mean

Series D. Soil Reconditioning Experiments, Farmyard Manure, Lime, Artificial Fertilizers and Green Dressings.

This was an exploratory experiment designed to obtain some indication of the interaction of artificial fertilizers, lime, farmyard manure, and green organic dressings.

Soils.—The soil varies from a clay loam to a sandy clay loam with 40 to 60 per cent. fine fractions.

History of the Block.—The land was first opened in 1923 and after ploughing, various species of derris were grown until April, 1929. In May, 1929, the area was sown with *Tephrosia toxicaria,* which failed, apparently owing to the poor soil conditions. The land then lay fallow until the present experiment was laid down in April, 1931.

The area under experiment was five acres, divided into four plots of equal size and treated as follows :—

A — No treatment (Control).
B — Lime 2 tons per acre.
C — Lime as in B + farmyard manure 20 tons per acre.
D — Farmyard manure 20 tons per acre.

Each of the above plots was divided into five sub-plots and the following artificial fertilizers were applied :—

Sub-plot 1 Control (No further treatment).
2 N.P. (Nitrogen and phosphate).
3. N. (Nitrogen).
4. N.K. (Nitrogen and potash).
5. N.P.K. (Nitrogen, phosphate and potash).

When the experiment was laid out the advantage of using basic manure had not yet been realised.

Lime was applied early in May and the farmyard manure about a fortnight later. The artificial fertilizers were applied at the beginning of June. The whole of the five acres was then divided into three strips across the above treatments and the strips were sown with *Crotalaria anagyroides, Centrosema pubescens,* and *Crotalaria usaramoensis,* respectively.

The *Crotalaria* spp. were pruned periodically as they commenced to flower and the prunings were laid on the surface *in situ.* The *Centrosema pubescens* was allowed to grow and cover the soil. *Crotalaria anagyroides* died out after the first pruning in October, 1931, and was resown during November of that year. These leguminous crops were allowed to remain for a period of about fifteen months at the end of which time they were turned into the soil.

Table VII.

Calculated Yields per acre of Green Material Produced by the Leguminous Crops (irrespective of artificial manures). Means of five Sub-plots.

Treatment	*C. anagyroides*	*C. usaramoensis*	*C. pubescens*	Means.
	lbs.	lbs.	lbs.	lbs.
A. Control	10,231	13,036	2,396	8,554
B. Lime	11,971	10,288	12,995	11,751
C. Lime + F.Y.M.	61,788	44,018	42,203	49,336
D. F.Y.M.	64,269	46,443	31,799	47,504
Means of all plots	37,065	28,446	22,348	29,286 General Mean

Table VIII.

Calculated Yields per acre of Green Material from the Leguminous Crops for the Different Artificial Manures. Means of three Sub-plots.

Treatment	1 Control	2 N.P.	3 N.	4 N.K.	5 N.P.K.	Means
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
A. Control	10,299	10,109	5,651	6,579	10,133	8,554
B. Lime	9,227	9,631	8,549	12,094	19,255	11,751
C. L + F.Y.M.	42,348	46,250	52,207	51,530	54,347	49,336
D. F.Y.M.	52,171	49,466	47,496	42,810	45,575	47,504
Means of all plots	28,511	28,864	28,476	28,256	32,328	29,286 General Mean

Table IX.

Calculated Yields per acre of Green Material from the Leguminous Crops Turned-in immediately before Sowing Gingelly.
Means of five Sub-plots.

Treatment	*C. anagyroides*	*C. usaramoensis*	*C. pubescens*	Means
	lbs.	lbs.	lbs.	lbs.
A. Control	1,618	557	2,396	1,524
B. Lime	1,049	403	12,995	4,816
C. Lime + F.Y.M.	2,268	1,882	42,203	15,451
D. F.Y.M.	1,999	1,563	31,799	11,787
Means of all plots	1,733	1,101	22,348	8,394 General Mean

Table VIII shows the green material obtained over the 15 months period and in the casė of *Crotalaria* spp. includes all prunings. The weight of *Centrosema pubescens* was obtained by calculation from the mean of ten samples taken from each sub-plot. Table IX shows the actual amount of green material turned in immediatey before sowing.

Subsequent to turning in the green matter at the beginning of October, 1932, the whole area was given a dressing of basic slag at the rate of one cwt. per acre. Gingelly was sown towards the end of October, 1932, at the rate of five lbs. per acre. Unfortunately germination was uneven and the area was resown during the first week in November. The weather was exceptionally wet after resowing, but subsequent germination was even.

It was early apparent that the gingelly seedlings were stronger on the plots to which farmyard manure was applied in 1931. It must be pointed out that owing to the effect of the farmyard manure, larger amounts of green material had been turned in on such plots. The plots which were treated with lime in addition to farmyard manure produced more vigorous plants than the unlimed farmyard manure plots. This was particularly noticeable in the *Centrosema pubescens* plots. On the plots which received no farmyard manure growth was slow, but was better on the limed plots than on the controls.

The gingelly crop was harvested during the first week in February, 1933, three months after sowing, and the yields are given in Tables X and XI.

Table X.

Calculated Yields per acre of Gingelly Seeds and Trash. Means of five Sub-plots.

Treatment	*Crotalaria anagyroides*		*Centrosema usaramoensis*		*Crotalaria pubescens*		Means	Means
	Stems and Trash	Clean Seed	Stems and Trash	Clean Seed	Stems and Trash	Clean Seed	Trash	Seed
	lbs. p. acre.	lbs. p. acre.	lbs. p. acre.	lbs. p. acre.	lbs. p. acre.	lbs. p. acre.	lbs. p. acre.	lbs. p. acre.
A. Control	490	127	540	98	370	84	467	103
B. Lime	814	214	956	307	998	329	923	283
C. L + F.Y.M.	2,415	564	1,543	624	3,482	814	2,480	667
D. F.Y.M.	1,159	206	758	206	943	175	954	196
Means of all plots	1,219	279	949	309	1,447	351	1,206	312

Table XI.

Calculated Yields per acre Gingelly Seed. Means of three Sub-plots.

Treatment	1 Control	2 N.P.	3 N.	4 N.K.	5 N.P.K.	Means
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
A. Control	96	76	68	92	184	103
B. Lime	296	272	252	224	372	283
C. L + N.P.K.	640	624	652	708	712	667
D. F.Y.M.	252	204	168	164	192	196
Means of all plots	321	294	285	300	365	312

After harvesting, the land was again ploughed and basic slag at the rate of two cwts. per acre was applied subsequent to the planting of groundnuts. The soil was drawn up into ridges eighteen inches apart and the seeds sown at one foot apart on the ridges at the rate of 80 lbs. of unshelled nuts per acre. Germination was even over the whole area.

Growth was good on the plots that were originally supplied with farmyard manure, the lime plus farmyard manure plot being slightly better in appearance than the unlimed farmyard manure plots. The limed, and also the control plots, were poor in comparison, but the former were slightly better in appearance than the latter.

A number of plants died from the effects of what appeared to be slime disease, but the area was not badly affected. Rats were troublesome just before the crop ripened and considerable damage was done, more especially to the farmyard manure plots (A) and (B) where the foliage was thick and afforded cover for this pest. Poisoned baits were laid down in large quantities and although most of these disappeared, the rats remained troublesome until harvest, which took place at the end of July and beginning of August, 1933.

Table XII.
Calculated Yields per acre of Unshelled Groundnuts.
Means of five Sub-plots.

Treatment	*C. anagyroides*	*C. pubescens*	*C. usaramoensis*	Means
	lbs.	lbs.	lbs.	lbs.
A. Control	127	42	40	70
B. Lime	95	63	42	67
C. L + N.P.K.	521	368	314	401
D. F.Y.M.	394	326	292	337
Means of all plots	284	200	172	219

Table XIII.
Calculated Yields per acre of Unshelled Groundnuts. Means of three Sub-plots.

Treatment	1 Control	2 N.P.	3 N.	4 N.K.	5 N.P.K.	Means
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
A	74	58	58	62	94	69
B	88	80	52	56	56	66
C	324	440	364	398	477	401
D	334	340	324	376	312	337
Means	205	229	200	226	235	218

Discussion of Results.

The figures in Table VII show that in the case of areas on which the two *Crotalaria* spp. were grown, farmyard manure alone gave slightly better yields of prunings than farmyard manure and lime. *Centrosema pubescens* appears to have derived benefit by the addition of lime and this was shown in the plot with lime alone where the cover was more complete than in the control plot.

The effect of artificial fertilizers has varied between plots, but the means of nitrogen only, nitrogen and phosphate, and nitrogen and potash are the same, while the complete mixture gave yields about 15 per cent. higher. It is doubtful whether the latter is significant.

The highest-yielding plot was that to which farmyard manure plus lime was originally applied and *Centrosema pubescens* turned in, the *Crotalaria usaramoensis* block being second, and *C. anagyroides* third. The means for all plots in the green manure blocks are also in the same order.

When the total weight of green material produced by the leguminous crops (Table VII) is compared with the total weight of the gingelly crop (Table X) there appears to be no correlation between green leguminous material produced and the yields of gingelly.

General Discussion.

With one exception all crops were low, and as Table XIV shows, even successive heavy dressings of cattle manure have failed to raise yields to those normally to be anticipated.

Table XIV.

Normal Crop lbs. per acre	Series A. (i)	Series A. (ii)	Series B. (i)	Series B. (ii)	Series D.	Series C.
Maize 2000-2500	485 (max)	1600 (max)	468 (max) 336 (mean)			
Tobacco 7000-11000	3700 (max)	4800 (max)				
Gingelly 600					162 (mean)	312 (mean) 667 (max)
Cow pea 500				134		
Groundnut 1000-1300						401 (max) 219 (mean)

It is clear however that by treatment with cattle manure or by a combination of phosphatic manure and green manuring it is possible to obtain crops of some sort on land otherwise absolutely infertile for rapidly-growing food or cover crops.

Of the two treatments, cattle manure is superior in respect of vigour of plant and residual effect. The enhancement of yield found in experiment D as a result of combining lime with cattle manure has been observed in pot experiments with other local soil types. This enhancement is not necessarily obtained with artificials and in some cases decreases as the result of liming have been noted.

In order to test the possibility that owing either to submergence (swamp conditions) in the recent past, or the fact that fallowing of dark-coloured soil might result in undue heating and partial sterilisation of the soil flora, pot culture experiments were carried out with gingelly and maize in which (*a*) very small quantities of cattle manure and (*b*) large dressings of the same manure sterilised by heating were applied. In the result (*a*) gave poor or no growth and (*b*) excellent growth, from which it follows that the bacteria carried by the manure do not play a part in its specific and marked effect.

Confirmation of the fact that the soil was not sterile was obtained by observations on nitrification.

The problem of this soil, like almost all dealing with the vexed question of fertility, must await further work for its solution.

Fortunately, areas of quartzite valley soil are not extensive, but such as exist are not infrequently occupied by Chinese squatters who mainly grow sweet potatoes and the like as green food for pigs. These crops are heavily manured with pig manure and it is clear that considerable caution should be exercised in interfering with this practice.

REVIEW OF MALAYAN RUBBER PLANTING STATISTICS

BY

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Deputy Registrar-General of Statistics.

The following review treats of the rubber-planting industry in the Federated Malay States and Straits Settlements in detail, statistics for these areas being complete to the end of 1933. Similar data are not available for certain of the Unfederated Malay States, and in such cases it has been necessary to make use of the 1932 statistics. The publication of these statistics—although incomplete as far as certain States are concerned—is justified in view of the introduction of rubber regulation.

The information concerning estates of 100 acres and over has been compiled from the replies to a questionnaire submitted to each estate at the end of 1933, and from monthly statistics collected from each estate of 100 acres and over.

Data concerning holdings of under 100 acres are less complete, owing to the very large number of such properties, to the stage of literacy of the majority of the owners and to their diverse nationalities. Collection of anything approaching accurate statistics from small holdings would necessitate individual inspection, work which at present is quite beyond the resources of the Statistical Department. It should be possible in the present year to revise the data by collaboration with those responsible for the working of the new scheme for rubber regulation. The present statistics of areas of small holdings are based on data obtained during the application of the Stevenson Restriction Scheme, areas planted subsequently being reported to the Department by the Government Administrative Branch.

The information here given is grouped under four sections (i) Areas, (ii) Production, (iii) Prices, (iv) Labour.

(i) Areas.

Area Planted with Rubber.

The following table states the present position, as far as is known, regarding the distribution of rubber areas in Malaya. The differentiation of "tappable" and "young rubber" in the case of estates of 100 acres and over is complied from statements made by individual estates. In the case of small holdings, young rubber is taken to be rubber plants planted in the year 1925, or in any subsequent year. This basis conforms with the Federated Malay States Enactment to regulate the production and export of rubber.

Table 1.
Total Area in Malaya planted with Rubber Trees: end of 1933.

State or Territory	Estates of 100 acres and over		Estates of under 100 acres		Total Planted Area
	Tappable.	Young rubber.	Tappable.	Young rubber.	
	acres	acres	acres	acres	acres
Perak ...	253,227	20,793	221,556	30,192	525,768
Selangor ...	310,003	32,475	138,833	16,687	497,998
Negri Sembilan ...	233,592	40,607	66,880	15,279	356,358
Pahang ...	46,712	20,178	57,829	18,435	143,154
Total F.M.S. ...	843,534	114,053	485,098	80,593	1,523,278
Dindings ...	7,368	360	7,279	388	15,395
Malacca ...	121,152	5,739	67,898	7,015	201,804
Penang Island ...	1,366	261	9,505	1,707	12,839
Province Wellesley ...	44,285	783	16,052	3,774	64,894
Singapore ...	28,842	1,511	12,469	312	43,134
Total S.S. ...	203,013	8,654	113,203	13,196	338,066
			Total area estates of under 100 acres at end 1932.		
Johore* ...	325,747	132,217	396,725		854,689
Kedah* ...	114,551	80,157	106,460		301,168
Kelantan ...	25,793	6,688	58,789		91,270†
Trengganu ...	4,543	274	20 000		24,817
Perlis ...	1,181	339	3,687		5,207†
Total U.M.S. ...	471,815	219,675	585,661		1,277,151†
TOTAL MALAYA ...	1,518,362	342,382	1,277,751		3,138,495†

* Complete returns in respect of the year 1933 have not yet come to hand. The figures here given are therefore those of 1932. For estates of under 100 acres in the Unfederated Malay States, 1932 figures are here given in the absence of returns for the year 1933.

† These figure may disagree slightly with those published in the *Rubber Statistics Handbook, 1934.*

From the above, it will be seen that of the total area planted with rubber trees in Malaya, nearly 41 per cent. is contained on estates of under 100 acres each.

It is estimated, but there is no direct statistical evidence to support the statement, that the area of rubber on estates of between 25 and 100 acres is over 300,000 acres or about 10 per cent. of the total area. These figures are important because field observations indicate that the quality of tapping on such holdings is equal to that in the larger estates.

Newly Planted Areas.

The total area of rubber in the Federated Malay States and Straits Settlements as shewn above exceeds the previous year's return by 12,353 acres. Part of this increase is due to areas which have been recorded for the first time. On estates of 100 acres and over, 4,187 acres in the Federated Malay States and 374 acres in the Straits Settlements were planted during the year, and the area abandoned or destroyed during this period was 1,755 and 267 acres respectively. On small holdings, 2,092 acres were planted in the Federated Malay States and 1 acre in the Straits Settlements.

Reserve Land.

In view of the condition laid down in respect of rubber regulation that no new areas shall be planted with rubber, it is of interest to note that the area of reserve land held by the estates of 100 acres and over at the end of 1933 was 171,201 in the Federated Malay States and 21,099 acres in the Straits Settlements of which, however, 11,444 acres are known to be swamps, building sites or land otherwise unsuitable for rubber planting. Similar figures for the Unfederated Malay States are not available, but those of 1932 were 196,618 acres. The reserve land held by estates in Malaya is therefore about 14 per cent. of the area already planted.

Number and Size of Estates.

There is a total of 2,332 estates of 100 acres and over in Malaya. The distribution is shewn in Table 2.

Table 2.

Number and Size of Estates of 100 acres and over.

Size of Estates	Federated Malay States		Straits Settlements		Unfederated* Malay States		Total*	
	No. of estates	Total acres	No. of estates	Total acres	No. of estates	Total acres	No. of estates	Total acres
Over 5000 acres	14	104,372	5	34,689	1	7,943	20	147,004
Between 1000—5000	302	552,797	49	106,966	10	19,201	360	678,964
„ 500—1000	235	169,199	42	28,840	7	5,444	284	203,483
„ 100—500	594	131,219	193	41,172	29	6,230	816	178,621
Total	1,145	957,587	289	211,667	47*	38,818*	1,480*	1,208,072*

* Excluding Johore and Kedah for which States no figures are available.

Nationality of Ownership.

With very few exceptions, areas of under 100 acres each are Asiatic-owned. The most recent returns concerning estates of ever 100 acres each are shewn in Table 3.

Table 3.
Nationality of Ownership of Estates of 100 acres and over.

Nationality of Ownership	Federated Malay States		Straits Settlements		Unfederated Malay States		Total	
	No. of estates	Total acres	No. of estates	Total acres	No. of estates	Total acres	Total acres	No. of estates
European	666	813,011	83	142,541	227	438,485	976	1,394,037
Chinese	311	100,582	154	54,094	519	202,266	984	356,942
Indian	134	30,366	41	11,008	92	21,695	267	63,069
Others	34	13,628	11	4,024	60	59,188	105	76,840
Total	1,145	957,587	289	211,667	898	721,634*	2,332	1,890,888*

Thus it is seen that in Malaya, with a total of 3,168,639† acres under rubber, 1,774,602 acres or 56 per cent. are owned by Asiatics.

Constitution of Estates.

It has been somewhat difficult to determine in some cases whether particular limited liability companies are non-Asiatic or Asiatic-owned. In some cases it has been possible to determine this point by personal knowledge, in other cases the nationality of the majority of directors has been the deciding factor and again in other cases it was decided by the country in which the company is incorporated. It will be realised therefore, that many cases of uncertainty remain, but such doubtful cases cannot materially influence the total. Private owners are those who hold the lease direct from Government. Table 4 summarises the information and demonstrates the enormous preponderance of planted rubber owned by limited liability companies over that owned by private individuals.

* These figures do not agree with those given in Table 1, having been compiled subsequent to the 1932 figures included therein and prior to the end of 1933.

† This figure is based on Table 3 and not on Table 1.

Table 4.

Nationality of Ownership of Estates of 100 acres and over in Malaya.*

Nationality of Ownership	Limited Liability Companies		Private Limited Liability Companies and Privately Owned Estates.		Total	
	No. of estates	Total acres	No. of estates	Total acres	No. of estates	Total acres
European	610	924,493	163	63,913	773	988,406
Chinese	18	14,268	461	143,128	479	157,396
Indian	—	—	178	42,794	178	42,794
Others	10	6,613	40	12,863	50	19,476
Total	638*	945,374*	842*	262,698*	1,480*	1,208,072*

Budgrafted Areas.

The area of budgrafted rubber trees in Malaya has assumed a position of considerable importance during the past two or three years. Of a total planted area in the F.M.S. and S.S. of 93,934 acres, no less than 86,142 acres are owned by non-Asiatics. Total production of rubber from these areas has been small up to the present, for only 6,141 acres were tapped during 1933. The area planted during the year 1933 amounted to 3,476 acres, of which 3,318 acres are in the Federated Malay States. Relative figures cannot be given for the whole of Malaya owing to the absence of complete returns from the States of Johore and Kedah. Table 5 gives a summary of information concerning the distribution of budgrafted areas.

Areas out of Tapping.

The very low price of rubber during the year resulted in a large area of rubber being thrown out of tapping. It is probable—but not an invariable rule—that the areas not tapped were those from which low yields were to be expected. It has also to be remembered that low prices were responsible for the fact that many areas of rubber trees that had reached a tappable size were not opened up.

As the price of the commodity improved during the year the area of tappable rubber trees not tapped decreased. It was very noticeable that small-holders were more adaptable to the varying conditions of the market; an increase in price had an immediate effect on production, while local factors—such as padi planting—exercised an influence on the area tapped in any one period.

In the following table (6) the percentage of rubber untapped is based on the acreage of tappable rubber as at the end of 1932; *viz*: large estates in Malaya,

* Excluding Johore and Kedah, for which States no figures are available.

Table 5.
Area of Rubber Treees Budgrafted, end 1933.

State or Territory	Budded rubber at end 1933	Budded rubber planted out during 1933	Tappable area of budded rubber at end 1933	Budded rubber being tapped at end 1933	Budded rubber immature at end 1933
	acres	acres	acres	acres	acres
Perak ...	12,947	1,573	2,963	1,221	9,984
Selangor ...	21,993	464	5,143	2,399	16,850
Negri Sembilan ...	39,043	97	11,289	630	27,754
Pahang ...	15,179	1,184	2,914	1,562	12,265
Total F.M.S. ...	89,162	3,318	22,309	5,812	66,853
Straits Settlements	4,572*	158	1,039	329	3,533
Johore ...	50,463§	not known	5,400‡	not known	45,063‡
Kedah ...	17,667†	„	12,986	„	4,681
Kelantan ...	2,695	—	73	—	2,622
Total U.M.S. ...	70,825	—	18,459	—	52,366
TOTAL MALAYA ...	164,559	—	41,807	—	122,752

1,486,181 acres. The figures for small holdings refer only to the F.M.S. and S.S. and are based on a tappable area of 510,500 acres in the Federated Malay States and 121,000 acres in the Straits Settlements.

The area of tappable rubber untapped on small holdings was estimated by means of counting the number of holdings out of tapping along the sides of main roads; the percentage number of holdings untapped was then applied to the known total area of rubber in each District. For these observations, the holdings on either side of over 700 miles of road are examined quarterly. While it is not claimed that the method will give accurate results, it is evident that it supplies a useful index figure and is an approximation of the actual area out of tapping.

* Of which 3,300 acres are in Malacca, 790 acres in the Dindings and 439 acres are in Province Wellesley.

† Returns from Kedah not yet complete. Figures here given are those reported at end of 1932.

§ Returns from Johore not yet available. Figures here given are those reported at end of 1932.

‡ Estimate.

Table 6.
Areas out of Tapping in Malaya 1933.

Month	Estates of 100 acres and over in Malaya		Holdings of under 100 acres				Average price of Rubber in Singapore cents per lb.
			Federated Malay States		Straits Settlements		
	Acres of tappable rubber not tapped	Percent. of total tappable rubber	Acres of tappable rubber not tapped	Percent. of total tappable rubber	Acres of tappable rubber not tapped	Percent. of total tappable rubber	
January	319,918	21.5					6.76
February	328,034	22.1	133,000	26	48,600	40	6.23
March	326,843	22.0					6.09
April	327,378	22.0					6.94
May	314,664	21.2	70,000	14	27,700	23	9.05
June	306,636	20.2					10.83
July	292,609	19.7					12.65
August	280,029	18.8	49,000	10	17,600	15	12.32
September	273,225	18.4					12.05
October	267,921	18.0					12.84
November	258,587	17.4	45,000	9	14,000	12	13.19
December	247,746	16.7					13.60

For comparison of area out of tapping with the price of rubber, the average monthly price of rubber is shewn in the last column in the above table.

The greater influence of the price of rubber on production from small holdings is also shewn in Table 7.

(ii) Production.

The total production of rubber in Malaya in 1933 amounted to 460,743 tons, of which 220,639 tons, or 47.9 per cent. were from holdings of under 100 each. The detailed monthly production figures are shewn in Table 7.

Production Rate.

The production of rubber on estates of 100 acres and over, based on the area actually tapped, averaged 456 lbs. per acre in the Federated Malay States and 423 lbs. per acre in the Straits Settlements. Corresponding figures for holdings of under 100 acres were 463 lbs. per acre and 546 lbs. respectively. The high figure for production rate on small holdings in the Straits Settlements is

Table 7.
Production of Rubber in Malaya 1933.

Month	Estates 100 acres and over	Holdings under 100 acres	Total
	tons	tons	tons
January	19,716	16,089	35,805
February	18,763	12,786	31,549
March	17,080	14,798	31,878
April	17,202	14,851	32,053
May	19,392	18,346	37,738
June	20,550	18,955	39,505
July	20,293	21,692	41,985
August	21,356	19,672	41,028
September	20,422	19,415	39,837
October	21,423	19,986	41,409
November	21,545	20,299	41,844
December	23,269	21,936	45,205
TOTAL	241,011	218,825	459,836

largely due to the high yield returns for December 1933 which are so high and inexplicable that they must be accepted with reserve.

The rates of yield from small holdings in the Federated Malay States and Straits Settlements are higher than those from the estates of 100 acres and over and confirm figures of a similar nature published in past years. Further confirmation of the yield per acre from small holdings was obtained by Meads,* who took records of 75 small holdings distributed throughout the country and found a yield at the rate of 477 lbs. per acre.

(iii) Prices.

The price of rubber rose steadily from May onwards, largely on the expectation of some form of restriction of production or exports. The average monthly Singapore prices of standard smoked sheet and the average prices for small-holders' rubber of various grades in Singapore and Penang are given in Table 8. Details of prices in Districts are now published monthly in *The Malayan Agricultural Journal.*

* Meads, H. D.—"Bark Consumption and Bark Reserves on Small Rubber Holdings in Malaya", Special Bulletin, Department of Agriculture, S.S. and F.M.S. Economic Series No. 4, 1934.

Table 8.

Market Prices of Rubber from Small Holdings, Malaya 1933.

(Dollars (S.S.) per picul of 133⅓ lbs.).

Month 1933	Singapore			Penang
	Smoked Sheet	Unsmoked Sheet	Scrap	Unsmoked Sheet
January	8.00	7.00	3.20	—
February	4.00—8.00	3.00—6.80	1.00—4.00	—
March	7.60	6.80	2.50	—
April	7.80	6.80	2.70	8.60—6.20
May	11.80	11.00	5.00	7.00—10.30
June	13.50	12.25	5.00	11.20—14.00
July	17.50	16.00	7.00	12.00—18.40
August	15.00	14.00	6.00	13.00—15.50
September	15.00	14.00	5.50	11.50—13.50
October	15.50	14.50	5.00	12.60—14.40
November	16.50	15.00	5.00	12.60—14.20
December	16.50	15.50	5.50	13.30—14.60

(iv) Labour

Returns have been rendered to the Statistics Department by estates of 100 acres and over respecting the labour force employed at the end of 1933. The total labour employed on rubber estates in the Federated Malay States is 124,500, of whom 85,900 are Indians and 33,400 Chinese. Dependents of this labour force resident on estates are 47,600, of whom 43,550 are Indians and 2,800 Chinese. Of the Indian dependents 34,100 are children.

Corresponding returns from rubber estates in the Straits Settlements give :— Labour force 25,500 of whom 15,000 are Indians and 5,400 Chinese and 3,700 Malays : dependents 8,900 of whom 7,000 are Indians (including 5,700 children).

Similar figures for the Unfederated Malay States are not yet available, but from such returns as have been received, it is noted that the proportion of Malays employed is much higher than it is elsewhere in the Peninsula.

Information respecting the labour force employed on holdings of under 100 acres would be interesting but is impossible to collect. In the following

table (9), shewing the number of labourers employed per 100 planted acres of rubber, on estates of 100 acres and over, the first column gives the nationality of owners, subsequent columns shewing the nationality of labour employed by each group of owners.

Table 9.

Number of Labourers employed per 100 planted acres of Rubber December 1933.

Owner of Estate	Employees					
	Indian Labourers	Chinese Labourers	Javanese Labourers	Malay Labourers	Other Labourers	Total Labourers
Straits Settlements :—						
Non-Asiatic	9.46	1.22	.39	.94	.14	12.15
Chinese	1.18	6.07	.80	3.72	.10	11.87
Indian	8.39	3.24	.42	.26	—	12.21
Others	2.73	5.26	3.38	3.19	—	14.56
Federated Malay States :—						
Non-Asiatic	10.20	2.70	.18	.17	.03	13.28
Chinese	1.20	9.10	.28	.75	.02	11.35
Indian	6.77	5.97	.22	.62	—	13.58
Others	1.98	8.95	.46	2.30	—	13.69

THE COLOURED SCUMS OF PADI FIELDS.

BY

W. N. Sands,

Principal Agricultural Officer, Kedah.

Early in each season after cultivation has been started in the flooded padi fields, coloured scums appear on the surface of the water. The colours range from bright green to brick-red and very striking effects are produced over large areas, especially during periods of sunshine.

The colours are not due to mineral salts, or other matter in solution or suspension, but to myriads of minute motile algae. The phenomenon is particularly noticeable in fine weather because strong light attracts the organisms to the surface of the water, where, owing to their enormous numbers, they form a thin scum. This scum often drifts to the sides of fields with the surface currents caused by the prevailing breezes.

If a small quantity of water with green scum is collected and examined in bright light under a microscope, it is seen to contain several forms of minute, swiftly moving bodies containing chlorophyll. The most abundant species is an elongated, more or less fish-shaped one which has been identified by Professor M.O.P. Iyengar, University Botany Laboratory, Teynampet, Madras, as *Euglena proxima,* Dang. Two other smaller round forms also occur, but are not as abundant, and these also have been named by Professor Iyengar as *Trachelomonas volvocina,* Ehrenb., and *Trachelomonas intermedia,* Dang.

All of the species belong to the genera of lower plants which are grouped under the Volvocales. In this group there are two chief divisions: (*a*) that in which the plant consists of a few to many cells collected together and enclosed in a jelly-like envelope to form a family (coenobium) and (*b*), where it exists as a single cell and leads an isolated existence. The three species described belong to the latter division. Each consists of a single cell with a long fine whip-like appendage (flagellum) which protrudes through the gelatinous envelope at one end of it, and which by its active movement enables the alga to swim rapidly through the water.

The younger green stage of these algae is succeeded by the older dark-red one. This colour-change is due to some alteration in the character of the chlorophyll and is associated with the solidifying of the envelope and other changes to form the oospore, or resting stage, of the plant.

Abstract.

NINETEENTH REPORT OF NATIVE RUBBER CULTIVATION IN THE NETHERLANDS INDIES.

Second Quarter 1934.

Prepared by the Bureau of Agricultural Economics of the Agriculture Fishery Service of the Netherlands Indian Department of Economic Affairs at Batavia, Java, and dated 12 September 1934.

The Report covers the second quarter of 1934 and gives incidental data to the end of August 1934.

General Review.

The April reports on the progress of the restriction plans increased the confidence felt of speedy and favourable solutions of the problems raised in the negotiations. Rubber prices advanced until May 8, when the quotations for standard Java sheet in Batavia were 23 cents per ½ kgm. Thereafter there was a reaction as a result of the publication of the provisionally fixed restriction percentages, which were lower than the rumours first spread had led the public to believe. As a consequence, standard sheet fell to 17⅞ cents on 24 May. In June the price slowly recovered and the month closed with a quotation for Java standard sheet in Batavia of 21¼ cents per ½ kgm.

The average for the first half of July was slightly higher and amounted to 21.8 cents and in the second half of that month the average was 22.1 cents. This increase in price continued during August and the first and second halves of the month shewed average quotations of 22.4 and 23.4 cents respectively.

At first the price of "blanket" rose more sharply than that of "sheet" and on May 8 the price relation was 84 : 100. Thereafter, the relation changed in a way less favourable for "blanket". On 1 July the "blanket" price was only 72 per cent. of the price of standard sheet. This phenomenon was probably connected with the very large offers of wet native rubber made to the re-finishing factories. In June, a greatly diminished offer of native rubber was coupled with an improvement in the price relationship, so that the average quotation for June for "blanket" was about 77½ per cent. of the average for "sheet". In July and August the percentage changed but little.

According to the international rubber agreement which came into force on 1 June, a basis quota of 358,000 tons of dry rubber was assigned to the Netherlands Indies. This was divided between the estate rubber and the native rubber in the proportion of 100: 71½, a relationship that existed in 1929 between the exports of the two categories and is more favourable to the native rubber than the figures in any other subsequent years. In this way, the basis quota for native rubber was fixed at 149,000 tons, 169.000 tons, 188,000 tons, 198,000 tons and 205,000 tons in the years from 1934 to the end of 1938.

An individual restriction scheme was drawn up for the estates based on the data presented, and the standard production of the estates between which the export quota was to be divided was worked out from these data. It proved that this scheme was not applicable to the native rubber in the outer islands because in the first place, the necessary data for the calculations of basic standard productions were not available and the accumulation of these figures would have involved much time and costly work, but still more so because the potential production of the native rubber plantings was believed to be so great that if it were divided into the total quota permitted the individual amounts would have been very small. This would have implied that that portion of the population making its living principally by family-worked rubber plantations would have suffered at the expense of the owners of remote, often neglected plantations, or of plantations that are so large that they can only be worked by the aid of hired help; owners, in other words, who in the present circumstances cannot be regarded as genuine producers.

After prolonged conference and after taking into consideration all the difficulties that presented themselves, the Government decided to enforce the restriction on native rubber by imposing a special export tax, based on the experience that there existed a definite connexion between the price of rubber and the amount of native rubber exported. A reduction of the amount exported could therefore be brought about by manipulating the export tax.

This export tax was fixed for June at 10 cents per kgm. of dry rubber, with this stipulation, that the tax should be applied at once beginning on June 1 on all wet rubber (groups II and III of the export schedule). This postponement of 1½ months for the dry rubber was decided on in view of the time needed for the refinishing factories to prepare and dry off their end-product, blankets and bark-crepe.

Beginning on July 1 the basis of the export tax was raised to 16 cents per kgm. (to take effect for group I rubber on August 16), and on August 1 this basis tax was raised again to 20 cents (to take effect for Group I rubber on September 16). This same basis has been maintained for the month of September.

The effect of the export tax is shewn in the following table.

Exports of Native Rubber from the Outer Islands in Metric Tons.
(Calculated as the dry equivalent) Divided into Groups.

1934	Group			Total	Percentages of the total		
	I	II	III		I	II	III
January ...	2,341	322	12,630	15,293	15	2	83
February ...	2,296	346	12,033	14,675	16	2	82
March ...	3,239	430	17,077	20,746	16	2	82
April ...	3,740	411	16,944	21,095	18	2	80
May ...	4,877	991	22,223	28,091	17	4	79
June ...	5,182	556	11,830	17,568	29½	3	67½
July ...	6,750	554	9,038	16,342	41½	3	55½
August ...	5,618	304	6,538	12,460	45	2½	52½

(July and August provisional figures).

From the above table it may be deduced that the export tax is slowly having the desired effect, although the exports in August are above the alloted quota, which taking account of the internationally agreed restriction percentage of 0,0,10 and 10 in the months from June to September, should have been 11,250 tons in August.

The above figures also shew that the exports of dry rubber have increased at the expense of other grades. This is a result of the fact that with the high export tax, the advantages of the local preparation of dry rubber are much more obvious than formerly.

These advantages are temporarily increased because the period of 1½ months, which has been allowed for in fixing the export tax so as to give the re-finishing factories time for preparing and drying their end-product, proved to be quite ample for factories with well warmed drying sheds and for the people at large more than ample for the preparation of native sheets. The stimulus arising from this source in favour of preparing a dry product will, however, only be maintained as long as the tax must still be periodically raised.

In the past few months the rubber re-finishing factories have been working full time. In addition to this, reports are coming in from all sides concerning the importation of a large number of hand-mangles for preparing native sheets which are largely brought from Singapore and can be delivered for about f 15.00 each. This is especially taking place in the Western Division of Borneo, where many hundreds of mangles have been imported, with the result that in August the exports of wet rubber from that region were reduced to only 35 tons. The percentage of the total native rubber production exported as dry rubber was 17 per cent. from January to May, rose to 29½ per cent. in June, 41⅓ per cent. in July and 45 per cent. in August.

Another consequence of the imposition of the heavy export tax on native rubber has been that both the natives themselves and the exporters shew a general tendency to finish the product dryer than formerly; that is to say, to export the wet rubber with a smaller percentage of water in it than that on the basis of which it is taxed, thereby paying less tax on the finished article.

Since in this way the export tax was being avoided and its effect being negatived so that more rubber was actually being exported than appeared in the statistics, a general control was instituted by examining samples to find the actual loss in washing of exported batches of native rubber. In this way it was possible, by continually revising the conversion percentages for expressing the wet rubber as the dry equivalent, to adjust the calculation of the amount of dry rubber exported and the tax to be imposed as nearly as possible to the actual conditions of affairs.

Inseparably bound up with the restrictive system of export taxes on native rubber is the principle that the returns from these taxes shall be employed for the benefit of the inhabitants of the rubber-producing areas. This tax is not a fiscal imposition but merely a means of securing restriction. A portion of the value of the products he wishes to export is withheld from the exporter, which can only be defended in principle if the amount so withheld is applied at once indirectly to benefiting the districts from which the product came.

With this in mind, a beginning was made in July by lightening the fiscal burdens of the inhabitants (principally payment of the commutation taxes for enforced labour on behalf of the Government and municipalities from the sums received for the export tax, lightening obligations incurred in the matter of ground rent, concessions in regard to income taxes and land taxes, and so forth). In addition to this, money was ear-marked for performing useful works, providing information for the agricultural groups of the inhabitants (principally in regard to the preparation of rubber), for sanitary measures, while some Divisions wished to use the money for introducing another restriction scheme.

In regard to this latter idea it may be remarked that in Bangka and Billiton and Riouw Free-area, districts in which many registered Chinese leasehold estates are to be found and the production possibilities of the rubber plantations are not so out of all proportion far above the export quota that might ultimately

be assigned to the various Divisions, earnest efforts were made to pass over as soon as possible to individual restriction. Such steps are also being considered in the Divisions of Tapanoeli, Acheen and the estate area of Sumatra's East Coast.

In the months when rubber exports were large, especially from the larger rubber regions (Borneo, Djambi and Palembang) it was reported that there were still extensive areas of tappable rubber still untapped. During these months the family tapping system more and more gave place to the sharing systems, or to tapping by hired labour. Reports from the most recent months, however, indicate that in view of the reduced direct income to be derived from rubber growing the family tapping system is again coming into general practice.

The farming of foodstuffs held the full attention of the natives during the period being reviewed, which may be regarded as a good general sign, especially in these times of crisis, since in this way a certain degree of stability was guaranteed for the small farmer and the native community in general.

Local Reports.

Acheen and Dependencies.—In preparation for the possible institution of an individual restriction scheme, the native plantations in the Division of the East Coast of Acheen (the most important rubber district in the region) were registered. The number of *tappable* trees in the Sub-Divisions of Langsa and Tamiang of the above mentioned Division amounted to about 866,000 belonging to 2,907 owners.

The production figures for 150 native plantations were observed in order to calculate the average production per day. The result of this investigation was that 100 tappable trees yielded an average of 0.56 kgms. of dry rubber per tapping day.

Tapanoeli.—The imposition of the extra export tax appeared to have but little influence on production during June and July. This was due to the fact that the tax on dry rubber, the grade almost exclusively produced in Tapanoeli, only came into force in the middle of July.

Sumatra's West Coast.—In spite of the imposition of the extra export tax, the exports of rubber from Padang during June and July remained reasonably high, but fell off in August. The exports of native rubber by way of Sumatra's East Coast and Djambi increased in the second quarter of the year. The lower export tax in Pakan Baru and Djambi led to these places attracting a larger amount of the production of Sumatra's West Coast than usual. Beginning from the first of September the normal relationship will have been restored.

Palembang.—The exports from Palembang remained in May practically the same as the amount expected in April. There was no laying in of stocks; the monthly productions were regularly shipped. The smaller exports in June were partly due to the wintering of the trees. In the months of July and August the export tax and the work on the dry-rice fields exerted a marked influence on the already falling production.

The announcement that after May 1 strict measures would be taken against violations of the rubber assay regulations put an end to the practice of mixing scrap with the slabs and preparing slabs of too great thickness. The preparation of thinner slabs resulted in a diminution of the average water content.

Djambi.—The exports from Djambi fell off greatly in June to well below the average of the previous months. July and August shewed a still further fall. The reduction of the rubber tapping took place not only under the influence of the extra export tax but also because of the great demands on labour made by the ladang (dry rice) cultivation during this period.

The natives have already taken to making sheets to some extent, and the slabs exported are thinner and dryer than formerly.

Many iron hand-mangles were imported and this, coupled with the greater activity of the re-milling concerns and the preparation of dry sheets by the natives, resulted in an increase in the exports of dry rubber from 83 tons in April to 449 tons, 518 tons, and 335 tons in June, July and August respectively.

The exports from Djambi consist at the present moment almost entirely of wet rubber in the form of mixed wet products.

Riouw and Dependencies.—The exports from Indragiri declined in May, but increased again in July and August.

Bangka and Dependencies.—In April and May there was a marked decline in production, attributed to the harvesting of pepper, preparation of the land for dry padi planting and wintering of the rubber trees. According to rough estimates, during the first half of May some 80 per cent. of the tappable plantations were in production.

Western Division of Borneo.—Rubber production increased in the second quarter on account of termination of the rice harvest. In May 4,887 tons (dry equivalent) were exported. There was a falling off of production in some areas in June, and in August a marked diminution of the exports as a result of the imposition of the extra export tax.

Large scale production of dry rubber was begun.

All the re-finishing factories were working at full capacity. During the past few months there has been a great importation of iron hand-mangles from Singapore; Pontianak reports hundreds of mangles, Sambas an even greater number. As a rule the latex, after being strained, is now coagulated with acetic acid, rolled out into thin slabs in the mangle and dried several days in the sun. Then the half dried sheets are sold to the exporters who further prepare them in smoke houses to native smoked sheets and sell this product to Singapore, where there is a constant market for it.

The hand-mangles are often in the possession of the buyers who settle in the neighbourhood of a group of native plantations.

Southern and Eastern Division of Borneo.—This Division, with an export of 6,060 tons in May, created a record for the export from any Division in

this country in one month. A definitely greater activity was seen in the re-finishing industry. Exports during July and August were also at a high level.

In this Division, too, many hand-mangles were imported. There are plans for taking in hand the purchase and conversion of latex for preparing native smoked sheet on a large scale under the leadership and instruction of the Government.

Exports.

The exports of native rubber (dry equivalent in metric tons) from the Outer Islands to foreign countries during the first quarter of 1934 amounted to 50,714 tons, and in the second quarter to 66,754 tons, as compared with 13,420 tons and 25,597 tons for the first two quarters of 1933. The July and August 1934 exports (provisional figures) were 16,342 tons and 12,460 tons respectively.

Reviews.

Spices and Condiments.

H. G. Redgrove. 340 pages, bibliography and indexes; 26 half tone and 17 line illustrations Sir Isaac Pitman and Sons, Ltd., London, 1933. Price 15 shillings.

The object of this book, according to the author, is to provide an accurate and comprehensive account of spices and condiments for the spice-user. Mr. Redgrove points out that since Ridley's book on spices was published in 1912, considerable advances in knowledge have been made. Further, Ridley's book is essentially one for the spice-grower while the present work deals particularly with the botanical sources and chemical constituents of spices.

The book is divided into six sections. Section (i) is concerned with the uses of spices in dietary and the means by which ground spices, essences and essential oils are prepared for flavouring food and other uses. The remaining sections deal with the various spices themselves. The author adopts as a means of classification, a system based on the part of the plant from which the spice is obtained. The plants described are therefore grouped in the following sections—(ii) rhizomes and root spices. (iii) bark spices. (iv) flower spices, (v) fruit spices, and (vi) seed spices. This system is chiefly useful to the spice-user. From a botanical standpoint it has disadvantages since, in certain cases, plants of close affinity are separated. Attention is drawn to the various distinctions made between spices and condiments. The author suggests the use of the term "condiment" to denote a spice, or other seasoning material, used in a particular manner *i.e.* added to food which has been served.

The agriculturist will find the book of considerable value since it provides a clear description of all spices cultivated together with their correct botanical status, uses, and chemical constituents. It is not a guide to cultivation but rather a clear and concise reference book of general information. Spices of especial interest in Malaya are as follows:—ginger, turmeric, cloves, chillies, pepper and nutmeg. All these thrive under local conditions and are produced commercially. Others grown in the experimental stage are: zedoary, *Curcuma zedoaria;* lesser galangal, *Alpinia officinarum;* cinnamon, vanilla, and cardamom.

The author states that Malaya, once celebrated for its spices, has in recent years turned to the cultivation of rubber, which, in the long run, has not proved as profitable as confidently predicted. The statement is probably correct but the inference is erroneous. Prices of most spices recently fell to a low level and in several cases *e.g.* cinnamon, cloves, and pepper, proved unremunerative owing to over-production. The majority of spice crops require considerable expenditure in cultivation and manuring, and crop at infrequent intervals. With a limited market and fluctuating returns, it has been a doubtful proposition for landowners to plant spices when rubber has often offered such excellent prospects. The future is more hopeful, since under existing legislation rubber may not be planted and attention will be directed to other crops which offer possibilities.

J. N. M.

Fodder and Feeding Stuffs in Malaya.

C. D. V. Georgi, 35 pp. Department of Agriculture, S.S. and F.M.S., Special Bulletin General Series No. 17, 1934. Price 50 cents.

Of late years it has become realised in an increasing degree that the feeding of animals is a process which requires knowledge and skill for its successful practice.

The rule of thumb methods which previously prevailed have become replaced by the computation of rations on a scientific basis; the principles underlying feeding are now well understood and it is possible by varying the ingredients of an animal's food to fit it with considerable exactness to the duty which it is required to perform.

Information on the subject is, however, not always available to the agriculturist and planter in Malaya; in this bulletin Major Georgi has described the general principles involved and has supplemented it by analytical data concerning the composition of foodstuffs which are ordinarily employed in this country.

Interest in animal husbandry in Malaya is gradually extending and as the country becomes more permanently settled it may be expected to increase still further.

The work will be found to be of practical utility by all who are interested in animal husbandry and who feel their need for a handy work of reference in relation to the feeding of stock. With the information in this bulletin, stock breeders should find it easily possible to compute rations for their animals and to arrange their purchases of feeding stuffs in such a way as to secure the best results.

H. A. T.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports submitted by Field Officers.

The Weather.

In Kedah, Province Wellesley, Penang and the northern Districts of Perak, more or less severe flooding was experienced during the opening period of the month, which tended to bring the average precipitation above normal. In all other parts of the country, more particularly in the inland areas where conditions were abnormally dry, the average rainfall was not maintained.

Remarks on Crops.

Rubber.—Compared with prices for the previous month, price quotations over the period under review show little change. Scrap, and similar low qualities for which there has been no recent demand, has been bought in many centres throughout the country at about $15 to $17 per picul.

Extremely wet weather in Kedah, Province Wellesley and the Krian and Selama Districts of Perak during the early part of the month, restricted tapping, and difficulty was experienced in these areas in obtaining sufficient rubber to cover coupons. In the Krian District the force of storms and flood was sufficiently severe to cause very extensive destruction of trees on both small-holdings and estates.

As the result of conditions favourable to the fungus development, the control of mouldy rot and other bark diseases was rendered difficult. The position was further aggravated in rice-producing areas by the incidence of the planting season.

In other centres, with the exception of Johore, where weather conditions more nearly approximated normal, conditions are reported to be satisfactory. Tapping systems are not extravagant, progress in general upkeep is maintained, and on many Chinese properties thinning out has been noted.

In Johore, however, tapping continues to be severe, and every effort is being made to increase production. Catch crops, such as gambier and pine-apples are being removed, and in some cases where arecanuts have been inter-planted with rubber, the former are being cut out and disposed of for fishing stakes.

The departmental organisation for the distribution of approved fungicides continues to receive an increasing and satisfactory measure of support.

A somewhat widespread infection of *Oidium Heveae* was reported from the Segamat District of Johore; with the onset of rains, however, it is probable that the disease will rapidly diminish.

Asiatic Rubber Instructors attached to the Small-holders Advisory Service which was inaugurated in July, have made very satisfactory progress in the areas where they are at present stationed. As a direct result of their instructional activity, the manufacture of rubber from small holdings is already showing improvement, and much useful information is being accumulated.

Rice.—Heavy rains in the northern States caused much flooding in rice-producing areas, more particularly in Kedah and the Krian District of Perak. Newly-planted seedlings were extensively damaged. The staff of the Department rendered much assistance in the collection and distribution of seedlings to areas where nurseries had been destroyed. As adequate reserves of well-grown seedlings were available to replace losses, no permanent damage is anticipated.

In the more important rice-growing areas of the country, planting has made good progress, and crops so far present a satisfactory appearance.

Conditions of growth in the Segamat District of Johore are good, although water shortage has been experienced and some rat damage sustained. The "sawah" (wet padi fields) competition in this District has aroused much interest. Rats and birds have been responsible for much damage in this District. In the Muar District, however, little interest has been taken in rice planting, and the area under cultivation will be considerably less than that of last season.

Coconuts and Copra.—There has been no price improvement over figures for the previous month, and in many centres copra manufacture as a small-holding industry has declined.

A local Malay-owned kiln in Province Wellesley has again obtained Penang f.m.s. price for copra produced.

In Perak, rain and the incidence of padi planting hampered copra production in the District of Krian. Small-holding copra in the Bagan Datoh District brought $2.40 to $2.60 per picul. A satisfactory selling arrangement has now been made for the disposal of good quality copra from this centre, the standard of the product being guaranteed by an officer of this Department.

Further developments in the erection of improved small-holders' kilns are reported from Johore. A large kiln is now in course of erection at Ringgit, and it is probable that the pattern will be copied by other local manufacturers.

Fruit.—Durians and mangosteens are being harvested in Kelantan; jambus are cropping in the coastal areas of Johore and dukus in the Muar District. Machang, mempalam and jambu are in season in the Klang District of Selangor, and durians, machang, mata kuching and rambutan are available in Pahang. Crops, however, are irregular and generally poor.

Tapioca.—In Kedah a further 802 acres were planted to this crop in the Kulim District.

Owing to the shortage of raw material a factory in the Segamat District of Johore is closing down; a large plant, however, is being erected on the Kluang—Mersing road to deal with the crop in that locality.

Tobacco.—Interest in this crop is being maintained in the Kuala Muda District of Kedah, Perak Central, Pahang East and the Kluang and Batu Pahat Districts of Johore.

Arecanuts.—It is reported from Johore that prices of arecanut produce have advanced, especially for "Iris" and "Kosi" qualities: supplies however are short.

Pineapples.—All factories in Johore were closed down during the month. This off-season is being utilised for overhauling plant in readiness to commence the new season's operations during October-November.

In this State, small areas continue to be opened up for pineapple cultivation as a sole crop.

Padi Stations and Test Plots.

In Kedah, heavy and continuous rains checked the development of the plants in most of the plots at the Telok Changai Experimental Station, but subsequent dry weather led to an improvement. The Rantau Panjang Test Plot was flooded to a depth of 2½ to 3 feet for four days shortly after planting, but it is not thought that much permanent damage has been done. A total of 3,926 gantangs of selected padi seed and 84 large bundles of seedlings were distributed from departmental sources, and in addition, 4,842 bundles of seedlings were collected in the Kota Star District for distribution at Padang Lalang, to repair flood-damaged crops in that area.

Experimental areas in the Krian District of Perak were subjected to severe flooding which impeded progress. In most cases the crop was sufficiently robust to withstand the adverse conditions and no permanent damage has been sustained. With the subsidence of the water the planting programme was continued, and by the end of the month was nearing completion.

In other Stations and Test Plots, work has made satisfactory progress, despite in some cases the lack of adequate irrigation facilities.

Good progress continues to be made on new experimental areas in the course of development at Sungei Manik in Perak, Sungei Blat in Pahang and Panchang Bedina in Selangor.

Agricultural Shows.—The Department staged an instructional exhibit, and arranged lectures illustrated by lantern slides on subjects of interest and importance to small-holders at Shows held at Bentong and Raub in Pahang, Kuala Langat in Selangor and Mersing in Johore.

Rural Lecture Caravan.

A tour of the caravan in Pahang, which commenced during August, was completed on September 16th, important centres on the Pahang river and along the coast, and Pulau Tioman being visited. As usual, much interest was evinced and attendances were satisfactory.

DEPARTMENTAL NOTES.

Visit of the Acting Director of Agriculture to Kelantan and Trengganu.

At the request of the Kelantan Government the Acting Director of Agriculture visited that State from September the 3rd. to the 5th. inclusive, for the purpose of inspecting the Central Agricultural Station at Kota Bharu and the Pasir Puteh Padi Test Plots, reporting on the general agricultural work in progress and making suggestions for future developments.

On the conclusion of this visit he proceeded to the Besut, Kuala Trengganu and Kemaman Districts of Trengganu during the period September 6th. to 12th. inclusive in order to make recommendations at the request of the Government for the development of agricultural activities in that State.

Leave.

Mr. R. G. H. Wilshaw, Assistant Chemist, has been granted 24 days full-pay leave from 6 September 1934 to be followed by 4 months and 7 days leave on half-pay on the ground of ill-health.

DISTRICT AGRICULTURAL SHOWS.

Kuala Langat, Selangor.

After a lapse of six years, an Agricultural Show was held in this District at Morib on 23rd September, 1934. This is the third Show to be held in the Kuala Langat District.

Heavy rain fell in the morning which somewhat delayed the opening, which was performed by H.H. The Sultan of Selangor in the presence of a large gathering that included The Hon'ble the British Residents of Selangor and Negri Sembilan.

The Show was housed in temporary sheds, which were tastefully decorated, each *Penghulu* being responsible for one section.

All the sections were fully occupied with the exhibits, in spite of the fact that poor exhibits were rejected before the staging commenced. One of the most successful sections was that devoted to padi. Rubber exhibits were few in number, but of greatly improved quality.

The Department of Agriculture, the Rubber Research Institute of Malaya, the Health Department and the Infant Welfare Centre staged exhibits and demonstrations of an instructional nature.

A demonstration by the Malay Regiment and a display by four aeroplanes from the Kuala Lumpur Flying Club were the main items in an attractive programme of amusements which also included a physical strength display, fancy dress football match, a hockey match; and at night a Malay *ronggeng*, a *bangsawan* and a Tamil drama.

Besut, Trengganu.

The first Agricultural Show for the Besut District of Trengganu was held at Kampong Raja on September 6th, 1934.

Sections were provided for padi, fruit, vegetables, poultry, and arts and crafts and the general standard of the numerous exhibits was good. There were also some good samples of home-made coconut oil.

The Show was well attended and aroused much interest; it is hoped that another will be held next year when a better understanding of the object of such shows may be expected to lead to an increase in the number of exhibits.

Bentong, Pahang.

A District Agricultural Show was held, in conjunction with the annual buffalo show, at the Government English School, Bentong, on Sunday, 9th September. The opening ceremony was performed by the Hon'ble The British Resident of Pahang in the presence of a large audience.

The usual competitive sections were provided but although exhibits were numerous, the general standard of quality was only fair. It was unfortunate that exhibits were much too crowded which resulted in a large portion of them not been seen and rendered judging difficult.

The Department of Agriculture staged an educational exhibit of local interest and two Malay Officers were fully occupied in explaining the essential points of the exhibits. In the evening lantern lectures were given on poultry breeding and control of mouldy rot disease of rubber.

The buffalo show consisted of the winning beasts from the mukim competitions; some very excellent animals were exhibited.

Buffalo and Stock Show, Raub.

Of particular interest was the Buffalo and Stock Show held at Raub, on the 8th September.

Exhibits in the buffalo section were the prize-winning beasts from the mukim show and accordingly were of a high standard of quality.

Classes were also provided for goats, milking cows with calves, and poultry; the exhibits in the last section were definitely poor.

The Medical Department staged an exhibit dealing chiefly with child welfare and control of disease.

The Department of Agriculture staged an exhibit similar to the one at the Bentong District Show; a lantern lecture on poultry-keeping was given in the evening.

During the afternoon a buffalo timber hauling contest was held.

The Show was an undoubted success as was proved by the numbers of entries and the interest shown by local cultivators.

Statistical.

MARKET PRICES

September, 1934.

Rubber.—During September rubber failed to maintain its recent advance in price and at 24¼ cents per lb. for spot loose in Singapore closed at 1¼ cents per lb. less than its opening price. The average price for the month in Singapore of Smoked Sheet equal to London Standard was 25.09 cents per lb. as compared with 24.8 cents per lb. in August. The average price for September in London was 7.41 pence per lb. and in New York 15.26 cents gold per lb. as compared with 7.4 pence and 15.37 cents gold respectively in August.

Weekly prices paid during September for small-holders' rubber at three centres are shewn in Table I.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, September, 1934.

(Dollars per Picul.)

Grades.	Kuala Pilah,† Negri Sembilan.				Kuala Kangsar, Perak.				Batu Pahat, Johore.		
	6	13	20	27	5	12	19	26	5	12	26
Smoked sheet	30.70	30.58	29.00		3.012	30.12	29.46	28.84			27.70
Unsmoked sheet	26.92	24.68	27.14	27.09		26.69	25.92	26.04	26.50	27.09	
Scrap		15.00	15.00		15.00	15.83	16.00	16.50			16.30

Transport by lorry Kuala Pilah to Seremban 15 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases at Batu Pahat on 19th September.

† Kuala Pilah, 30th August, 1934. The price of unsmoked sheet should read $28.22 and not $20.44.

Palm Oil.—Prices for the whole month for the Malayan commodity are not available, but those for the beginning of September are shewn in the following table and indicate that the recent improvement in this market is being maintained. Basis 5 per cent. f.f.a.

Table II.

DATE 1934.	PALM OIL			KERNELS
	L'Pool/Holland/ Hamburg c. i. f. landed weights in bulk per ton £. s. d.	L'Pool/Continent c. i. f. per ton net in barrels £. s. d.	Halifax (Nova Scotia) c. i. f. landed weights per lb. Cents gold.	Fair Average Malayan Quality c. i. f. Landed Weight per ton on Continent. £. s. d.
September 5	12 0 0	14 10 0	—	7 0 0
	Later prices	not available.		

Copra.—The September prices of copra in Singapore continued almost unchanged at the present low levels. The sun-dried grade opened at $2.90 per picul, to close at $3, with an average for the month of $2.93 as against $3 in August. The mixed quality only averaged $2.28 per picul as compared with $2.40 in August.

Copra cake maintained its improved price and averaged $1.77 per picul for the month.

Rice.—The average wholesale prices of rice per picul in Singapore during August were as follows:—Siam No. 2 (ordinary) $3.13, Rangoon No. 1, $3.16, Saigon No. 1 (long grain) $3.17, as compared with $2.78, $2.77 and $2.82 in July. Corresponding prices in August 1933 were respectively $3.78, $3.01 and $3.47.

The average retail market prices in cents per gantang of No. 2 Siam rice in August were:—Singapore 23, Penang 24, Malacca 23, as compared with 22, 24 and 23 respectively in July.

The average declared trade value of imports of rice in August was $3.03 per picul as compared with $2.85 in July and $2.93 in June.

Padi.—The price paid for padi at the Government Rice Mill, Bagan Serai, remained unchanged at $1.50 per picul. A privately owned mill paid $1.40 per picul. Prices per gantang ranged from 5 cents to 12 cents in various parts of the country.

Tea.—Malayan tea was quoted in London during August at from 11d. to 1s. 0¼d. per lb.

Average London prices per lb. for tea consignments from other countries were as follows:—Ceylon 1s. 0.74d., Java 9.99d., Indian Northern 1s. 1.43d., Indian Southern 1s. 0.06d., Sumatra 9.64d. There was a further steady decline in prices during the month.

Tuba Root (*Derris*).—The Singapore average price of roots sold on rotenone content remained at $40 per picul during September, but owing to the scarcity of supplies, only small quantities of the roots sold at this figure were up to the minimum standard of 3 per cent. required by the trade.

Little business was done in roots sold on a basis of ether extract as the high price demanded in recent months has created a deadlock, buyers abroad offering considerably less than the local market price. The average price for the month was $30 per picul as compared with $34.50 in August.

Prices paid to growers in Johore ranged from $24 to $30 per picul.

Coffee.—Singapore prices of coffee in September shewed little variation in comparison with those of August. Sourabaya coffee opened at $19.50 to $20.50 per picul and weakened slightly to close at $19 to $20. Palembang coffee opening at $13.50 per picul, closed at $13, an average of $13.19 for the month as compared with $13.32 in August.

Local prices for coffee beans ranged from $13 to $30 per picul.

Arecanuts.—September average prices in Singapore were as follows:—Splits $4.81 to $5.88, Sliced $9.38 to $10.38, Red Whole $6.31 to $6.81, Kelantan $5.38 to $5.63, the price in each range depending upon quality. No prices were quoted for Bila Whole and Sourabaya Whole.

The average prices per picul quoted by the Singapore Chamber of Commerce were:—Best $4.87, Medium $4.58, Mixed $4.02.

Gambier.—Singapore prices improved during September, closing at $4.75 per picul for Block, and $8.25 per picul for No. 1 Cube. The respective averages for the month were $4.40 and $7.70 as against $4 and $7.31 in August.

Pineapples.—The Singapore market is at a standstill; harvesting of the winter crop will commence shortly and the factories will re-open in October. Average prices per case quoted for the month were:—Cubes $3.11, Sliced Flat $3.04, Sliced Tall $3.25 as compared with $3.16, $3.11, and $3.28 respectively in August. Prices for fresh fruit ranged from 70 cents to $4 per 100, according to quality. In Selangor, Sarawak pines ranged from $4 to $14 per 100.

Tapioca.—There were no fluctuations in the Singapore market during September with the exception of Pearl Seed which dropped 25 cents per picul at the close.

Average prices per picul were:—Flake Fair $3.65, Seed Pearl $5.70, Pearl Medium $5.85, as compared with $3.73, $5.75 and $6 respectively in August.

Sago.—This market also remained practically unchanged, Pearl, Small Fair easing 5 cents per picul at the close to average $3.94 for the month and Flour, Sarawak Fair was quoted throughout at $1.92½ per picul. The August average prices were:—$3.95 and $1.89 respectively.

Mace.—The commodity was in short supply during September and prices in Singapore rose considerably. Siouw averaged $90 per picul and Amboina $57 per picul as compared with $80 and $51 respectively in August.

Nutmegs.—The Singapore market continued without change at the August levels of $24 per picul for 110's and $25 per picul for 80's.

Pepper.—Prices advanced almost daily during September under buying pressure in London, but at the close of the month values in London tended to ease, stocks were high, and speculative buying appeared to have ceased. Average prices per picul in Singapore were:—Singapore Black $15.50, Singapore White, $40.30, Muntok White $41.70 as compared with August respective averages of $13.69, $36.63 and $37.69.

Cloves.—Singapore prices continued nominal at Zanzibar $35 and Amboina $45 per picul.

Tobacco.—Prices of sun-dried leaves ranged from $10 to $65 per picul. Java tobacco was quoted in Perak at $32 to $70 per picul and in Johore at $40 to $85 per picul.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Mackay & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY*

August, 1934.

Malaya.—Imports of foreign rice into Malaya during August were 54,515 tons and exports 15,191 tons, net imports accordingly being 39,324 tons. Net imports for the period January to August, 1934, were 302,241 tons, an increase of 7.5 per cent. over the corresponding period in 1934.

Of the imports during August, 47 per cent. were consigned to Singapore, 19 per cent. to Penang, 7 per cent. to Malacca, 17 per cent. to the Federated Malay States and 10 per cent. to the Unfederated Malay States. Of the total 68 per cent. came from Siam, 29 per cent. from Burma, 2 per cent. from French Indo-China and 1 per cent. from other countries.

Of the exports during the month under review, 57 per cent. were shipped to the Netherlands Indies and 43 per cent. to other countries. The various kinds of rice exported were:—Siam 8,233 tons (54.2 per cent.), Burma 4,335 tons (28.5 per cent.), French Indo-China 444 tons (2.9 per cent.), India 2,017 tons (13.3 per cent.), local production 162 tons (1.1 per cent.).

India and Burma.—Foreign exports for the period January to June, 1934, totalled 912,000 tons, as compared with 1,175,000 tons for the corresponding period in 1933, a decrease of 22.4 per cent.

The total exports of rice and bran from Burma for the period 1st January to 28th July, 1934, amounted to 2,713,728 metric tons as compared with 2,305,155 metric tons for the corresponding period of 1933, an increase of 17.7 per cent.

It is reported (*Straits Times*, Singapore, 29th August, 1934) that there has been a sharp rise in the Rangoon rice market and that there is a shortage in the balance of rice available for export as present stocks should be exhausted by the middle of November. It is the general opinion that prices in 1935 will be very strong owing to droughts in Europe and in other parts of the world, famine conditions in Central China and floods in India and the Far East.

Siam.—Exports of rice from Bangkok in July were 151,475 tons, giving a total for the first seven months of the year of 1,006,804 tons as compared with 961,789 tons for the similar period in 1933.

Japan.—It is reported in the *Trans-Pacific Journal* 23rd August, 1934, that the 1934 rice crop may fall 5 per cent. below a normal year's crop and it is estimated at 8,320,000 tons, a decrease of 1,616,000 tons, or 16 per cent. as compared with the actual crop in 1933.

It is also reported that notwithstanding the weather's recovery and sales of 140,250 tons of Government rice to the market, rice prices shewed no signs of falling.

French Indo-China.—Entries of padi into Cholon, 1st January to 15th September, 1934, totalled 1,182,288 metric tons, an increase of 34 per cent. as compared with 882,654 metric tons during the corresponding period of 1933. Exports of rice for the same period this year were 1,087,969 metric tons as compared with 985,914 metric tons for the similar period of 1933, an increase of 10.4 per cent.

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* Abridged from the Rice Summary for August, 1934, compiled by the Department of Statistics, S.S. and F.M.S.

According to a report on the Saigon Rice Market for August, 1934, prices rose during the month due to demands from China and India but closed on a fall with an undecided tendency.

Netherlands Indies.—Imports of rice for the period January to June, 1934, (*Economic Bulletin,* dated 1st September, 1934) amounted to 87,616 metric tons, a decrease of 62.5 per cent. as compared with imports of 234,118 metric tons during the corresponding period of 1933.

The area of wet and dry padi harvested during the same period this year amounted to 6,896,240 acres as compared with 6,864,130 in 1933, an increase of 0.5 per cent.

Ceylon.—Imports for the period January to August, 1934, totalled 321,472 tons, as compared with 298,886 tons for the same period of 1933, an increase of 7.6 per cent.

Of the 1934 imports, 14 per cent. were from British India, 63 per cent. from Burma and 23 per cent. from other countries.

Europe and America.—Shipments to Europe from the East were 877,297 tons for the period 1st January to 16th August 1934, as compared with 924,164 tons during the corresponding period in 1933, a decrease of 5.1 per cent.

Of the 1934 shipments 40 per cent. were from Burma, 6 per cent. from Japan, 43 per cent. from Saigon, 9 per cent. from Siam and 2 per cent. from Bengal. The corresponding percentages for 1933 were 51, 3, 39, 6 and 1 respectively.

Shipments to the Levant from the East during the period 1st January to 28th July, 1934, were 21,715 tons as compared with 20,457 tons for the same period in 1933, an increase of 6.1 per cent.

Shipments to the West Indies and America for the period 1st January to 12th July, 1934, were 110,231 tons, an increase of 12.3 per cent. as compared with 98,132 tons during the corresponding period of 1933.

MALAYAN AGRICULTURAL EXPORTS, AUGUST, 1934.

PRODUCT.	Net Export in Tons.				
	Year 1933.	Jan.-Aug. 1933.	Jan.-Aug. 1934.	August 1933.	August 1934.
Arecanuts ...	20,756	13,513	21,967	1,592	2,373
Coconuts, fresh† ...	100,609†	68,066†	65,096†	8,530†	6,869†
Coconut oil ...	17,568	11,759	16,267	1,252	1,758
Copra ...	110.543	60,545	60,525	13,919	6,223
Gambier, all kinds ...	2,560	1,637	1,447	276	208
Oil cakes ...	9,992	6,838	7,310	307	202
Palm kernels ...	1,983	1,148	1,886	186	222
Palm oil ...	12,101	6,130	8,724	1,207	1,336
Pineapples canned ...	59,582	46,845	53,864	6,487	5,482
Rubber§ ...	459,836§	292,476	309,784§	41,074§	39,369§
Sago,—flour ...	7,648	2,850	4,746	467*	758
„ —pearl ...	2,646	1,430	3,115	210	527
„ —raw ...	4,420*	2,649*	4,121*	219*	577*
Tapioca,—flake ...	9,881	7,239	4,616	570	182
„ —flour ...	702*	126*	1,316*	2	61*
„ —pearl ...	17,297	11,608	10,728	2,097	1,346
Tuba root ...	569½	313½	381½	43	33

† hundreds in number. * net imports. § production.

MALAYA RUBBER STATISTICS

Acreages of Tappable Rubber not Tapped on Estates of 100 Acres and over, for the Month ending 31st August, 1934.

State or Territory	Acreage of Tappable Rubber end 1933 (d)	Estates which have entirely ceased tapping		Estates which have partly ceased tapping (a)		Area of Tappable Rubber never been tapped		Total (3) + (5)	Percentage of (9) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Straits Settlements :—									
Province Wellesley	44,285	1,127	2.5	8,508	19.2	633	1.4	9,635	21.7
Dindings	7,368	112	1.5	841	11.4	193	2.6	953	12.9
Malacca	121,152	584	.5	16,527	13.6	3,130	2.6	17,111	14.1
Penang Island	1,366	184	13.5	398	29.1	201	14.7	582	42.6
Singapore Island	28,842	4,215	14.6	4,324	15.0	627	2.2	8,539	29.6
Total S.S. ...	203,013	6,222	3.0	30,598	15.1	4,784	2.4	36,820	18.1
Federated Malay States :—									
Perak	253,227	4,201	1.7	37,849	14.9	12,508	4.9	42,050	16.6
Selangor	310,003	3,621	1.2	43,801	14.1	11,255	3.6	47,422	15.3
Negri Sembilan	233,592	4,848	2.1	37,340	16.0	19,601	8.4	42,188	18.1
Pahang	46,712	4,367	9.3	15,457	33.1	9,609	20.6	19,824	42.4
Total F.M.S. ...	843,534	17,037	2.0	134,447	15.9	52,973	6.3	151,484	17.9
Unfederated Malay States :—									
Johore	365,400	11,081	3.0	23,609	6.5	22,090	6.0	34,690	9.5
Kedah (b)	126,588	4,051	3.2	26,277	20.8	23,318	18.4	30,328	24.0
Kelantan	25,793	2,061	8.0	2,180	8.4	5,418	21.0	4,241	16.4
Trengganu (b)	4,543	Nil	Nil	171	3.8	171	3.8	171	3.8
Perlis (c)	1,181	Nil	Nil	266	22.5	Nil	Nil	266	22.5
Total U.M.S. ...	523,505	17,193	3.3	52,503	10.0	50,997	9.7	69,696	13.3
Total Malaya ...	1,570,052	40,452	2.6	217,548	13.8	108,754	6.9	258,000	16.4

Notes :—(a) Area out of tapping on Estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.
(b) Registered Companies only.
(c) Rendered quarterly.
(d) Figures are as reported by estate managers.

N.B.—The increase in the figures in columns 3, 5 and 7 for Pahang and in column 7 for Kedah as compared with previous returns is due to the inclusion of additional estates newly registered.

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF AUGUST, 1934 IN DRY TONS.

State or Territory	Stocks at beginning of month 1: Ports	Stocks at beginning of month 1: Dealer	Stocks at beginning of month 1: Estates of 100 acres and over	Production by Estates of 100 acres and over: during the month	Production by Estates of 100 acres and over: January to August inclusive 1934	Production by Estates of less than 100 acres estimated 2: during the month	Production by Estates of less than 100 acres estimated 2: January to August inclusive 1934	Imports during the month: Foreign	Imports during the month: From Malay States & Labuan	Imports January to Aug. inclusive 1934: Foreign	Imports January to Aug. inclusive 1934: From Malay States & Labuan	Exports including re-exports during the month: Foreign	Exports including re-exports during the month: Local	Exports including re-exports January to Aug. inclusive 1934: Foreign	Exports including re-exports January to Aug. inclusive 1934: Local	Stocks at end of month: Ports	Stocks at end of month: Dealers	Stocks at end of month: Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States ...	...	9,752	8,869	11,877	93,524	8,973	70,518	Nil	Nil	Nil	Nil	12,554	6,188	118,411	58,482	...	11,576	9,137
Johore ...	...	1,914	2,281	3,642	29,553	4,739	35,198	Nil	2	Nil	270	1,645	5,906	12,998	53,483	...	2,518	2,509
Kedah ...	...	349	1,970	2,684	21,870	1,331	11,958	Nil	Nil	Nil	Nil	1,442	2,572	11,768	22,572	...	393	1,927
Perlis ...	...	41	10	13	111	14	269	Nil	Nil	Nil	Nil	Nil	34	Nil	379	...	32	12
Kelantan ...	...	150	168	279	1,878	601	5,516	Nil	Nil	319	Nil	99	622	732	6,922	...	231	246
Trengganu ...	...	55	50	187	1,773	93	884	Nil	Nil	Nil	Nil	Nil	280	Nil	2,657		55	50
Total Malay States	...	12,261	13,348	18,682	148,709	15,751	124,343	Nil	2	319	270	15,740	15,602	143,909	144,495	...	14,805	13,881
STRAITS SETTLEMENTS :-																		
Malacca ...	...	2,260	803	1,536	10,866	1,969		Nil		4		2,661		26,396		...	2,905	921
Province Wellesley	...	1,054	490	545	4,605	226		Nil		Nil						...	1,849	491
Dindings ...	...	26	138	112	867	103	18,851	Nil	13,840	Nil	133,210	7,280	Nil	64,929	Nil	...	40	139
Penang ...	2,854	14,476	13	14	100	84		2,732		19,625						3,394	14,412	12
Singapore ...	5,070	50,623	128	203	1,443	144		15,133		139,437		26,960		223,316		9,640	44,815	258
Total Straits Settlements	7,924	68,439	1,572	2,410	17,881	2,526	18,851	17,865	13,849	159,066	133,210	36,901	Nil	314,641	Nil	13,034	64,021	1,821
TOTAL MALAYA	7,924	80,700	14,920	21,092	166,590	18,277	143,194	17,865	13,851	159,385	133,480	52,641	15,602	458,550	144,495	13,034	78,826	15,702

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
20	21	22	23	24	25	26
DRY RUBBER	10,139	38,399	11,189	4,570	1,772	237
WET RUBBER	1,437	6,416	3,223	224	746	156
TOTAL ...	11,576	44,815	14,412	4,794	2,518	393

TABLE III
FOREIGN EXPORTS

PORTS	For month	January to Aug. 1934
Singapore ...	35,318	300,118
Penang ...	11,591	100,059
Port Swettenham.	5,156	44,589
Malacca ...	576	4,784
MALAYA ...	52,641	458,550

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January to Aug. 1934
Malay States ...	31,269	278,865
Straits Settlements	4,589	
MALAYA ...	35,858	278,865

Notes :—
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained
2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. *i.e.*, Column [9] = Columns [15] + [16] + [19] + [20] + [21] + [22] —[4]—[5]—[6]—[7]—[11]—[12]. For the Straits Settlements, Column [9]: figures for Singapore and Penang Islands represent sales or exports as shown by cess paid and for the mainland represent as previously purchases by dealers from local estates of less than 100 acres, reduced by 15 % to terms of dry rubber.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Domestic exports are reported by the Customs Authorities for the Malay States and by the Registrars of Imports and Exports for Province Wellesley, Malacca, Dindings and Labuan. For Singapore and Penang Island domestic exports are represented by sales or exports of rubber as shown by cess paid. (Figures for Brunei will it is hoped, be included, in futhure returns).
5. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 24 September, 1934.

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B.	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total	Total	Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.								
Railway Hill, Kuala Lumpur, Selangor ...	89.7	71.7	80.7	93	70	80	73	83.9	84.6	6.82	173.2	1.10	23	19	3	2		176.75	5.70	47
Bukit Jeram, Selangor ...	87.6	72.5	80.0	93	70	80	74	82.8	84.6	10.16	258.1	3.02	15	15	4	1	2	199.90	6.45	53
Sitiawan, Perak ...	89.7	72.4	81.1	92	71	86	75	84.0	85.2	3.13	79.5	0.68	13	11	1			186.90	6.03	49
Temerloh, Pahang ...	89.4	72.3	80.9	92	70	85	75	84.5	85.9	4.57	116.1	0.96	16	15		9		188.45	6.08	50
Kuala Lipis, Pahang ...	88.2	70.9	79.5	91	67	84	74	83.2	84.5	8.55	217.2	1.26	20	18	4	23	4	175.75	5.67	46
Kuala Pahang, Pahang ...	86.9	73.5	80.2	91	71	84	77	85.6	86.1	5.20	132.1	1.17	13	13	6		2	235.00	7.58	62
Kallang Aerodrome, S'pore ...	86.5	76.4	81.5	90	70	80	80	81.9	83.0	5.95	151.1	2.06	14	13	2	1		180.00	5.81	48
Butterworth, Province Wellesley ...	86.4	73.8	80.1	89	72	82	77	83.4	84.7	14.25	362.0	2.33	20	17	3		1	170.60	5.50	45
Bukit China, Malacca ...	84.2	73.5	78.9	87	71	79	76	82.9	83.9	6.27	159.3	2.41	14	10	2			169.95	5.48	45
Kluang, Johore ...	87.5	70.6	79.1	91	68	82	73	81.2	82.0	6.04	153.4	1.96	17	16	1	1		158.55	5.11	42
Bukit Lalang, Mersing, Johore	87.0	71.6	79.3	90	69	82	74	80.9	81.6	9.23	234.4	1.63	21	18	4	3		206.00	6.65	55
Alor Star, Kedah ...	86.4	73.8	80.1	91	72	79	76	85.3	85.9	17.35	440.7	2.78	23	21	5		1	171.40	5.53	45
Kota Bahru, Kelantan ...	89.4	73.3	81.3	92	71	87	76	84.3	84.9	9.22	234.2	1.86	17	13	8			209.55	6.76	55
Kuala Trengganu, Trengganu	87.7	72.3	80.0	90	70	81	75	82.8	84.4	6.14	156.0	1.45	16	13	2			196.65	6.34	51
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. Pahang ...	74.0	62.3	68.1	78	60	68	64	71.3	72.1	6.15	156.2	1.17	18	18	4	5	1	162.45	5.24	43
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.5	57.0	64.3	74	51	67	61	70.2	69.7	7.34	186.5	1.17	29	25			2	141.20	4.55	37
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	70.6	59.1	64.9	74	57	64	61			7.83	198.9	1.27	29	24			2	146 30	4.72	38

Compiled from Returns supplied by the Meteorological Branch, Malaya.

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THE

Malayan Agricultural Journal.

NOVEMBER, 1934.

EDITORIAL.

The Cultivation and Manuring of Coconuts. The results obtained in other countries on the cultivation and manuring of coconuts have but a limited application to the conditions in Malaya. The coconut soils of Malaya are heavy, whereas those in most countries in which coconuts are of importance are light sandy soils. The fact that coconuts respond to manuring in Ceylon, for instance, does not imply that it is equally suitable to Malayan conditions.

The response of coconuts in Malaya to cultivation and manuring has been the subject of study in the Department of Agriculture for the past few years. The summary of results of the experimental work during the last four years is given in an article under the title "Experiments on the Cultivation and Manuring of Coconuts in Malaya" which constitutes one of the chief features of the present number of this journal.

Although exceptions may be found, it is shewn that on normal soils in Malaya, with palms between 10 and 21 years of age, neither manuring nor liming of coconut areas will prove economical. The most satisfactory system would appear to be to supply the area with a cover which is periodically cut and to concentrate attention on adequate drainage.

In addition, investigation has been made into systems of cultivation; the comparative effects of cover slashed periodically, cover buried twice a year, and clean weeding with and without cultivation. The effect of these systems on the different estates on which the experiments were conducted is detailed and will repay study.

Experiments on cultivation and manuring coconuts must be interpreted from two points of view. In the first place, consideration must be given to a determination of the degree of significance of the results; and secondly, the practical man expects that experimental work on crop production shall not be entirely alienated from its practical aspect. Increased crop production may normally be anticipated as a result of judicious manuring and cultivation. As the yield thus increases, the cost of production of each extra unit of increase also rises, until a point is reached at which no further economic increase of production is possible.

It follows, therefore, that in times when the product demands a high market price, it pays to produce the higher units of production, whereas in times of low prices, lower production must prove more remunerative.

The conclusions regarding treatment of the land for coconut production have been reached with due regard to the financial aspect of the problems. The curtailment of expenditure with the least diminution of crop must be the basis of consideration at the present time, and it is in this light that these results of investigations of the Department of Agriculture are interpreted.

The Oil Palm Inflorescence.

The article in this number on the floral morphology of the oil palm places on record the facts in a complete form which we believe has not hitherto been attempted elsewhere. The planter of oil palms may possibly glance at the article and conclude that the writer in entering into the realms of botany thus alienates himself from estate interests. Closer consideration, however, may convince him that an appreciation of floral morphology of the oil palm is of very great practical value on the estate. The flower results in the fruit and one of the subjects upon which we venture to predict we have not yet heard the last word is the extent to which artificial pollination of oil palms is justified. The present article forms an introduction to this subject of pollination to which the author will return in a subsequent number.

Agriculture in Johore.

The Report on Agricultural Development in Johore, by Dr. H. A. Tempany, C.B.E., covers, without the Appendices, twenty-seven pages. The preparation of an abstract of this document proved somewhat difficult. The report is an authoritative statement of the present condition and great value of agriculture in that State, and indicates the future possibilities of development. The abstractor is faced with the alternative of exceeding the available space for the abstract, or of doing injustice to the author by reason of the omission of subject matter which is used cumulatively to support the writer's conclusions.

The main argument of the report is to shew the rapid growth of agriculture in Johore and the fact that at present a point has been reached at which production has attained its greatest height under the existing systems of cultivation. Further progress depends on greater systematization, the adoption of methods whereby husbandry may replace mere crop production. The plea, therefore, is for a close regard of the results of investigations already carried out by the Department of Agriculture, Straits Settlements and Federated Malay States; for the inauguration of further experimental work on the particular problems which have become evident; and for the shouldering by the Johore Government of its share of the cost of the services of this organisation in view of the fact that the research work of the Department is of direct value to that State.

Original Articles.

EXPERIMENTS ON THE CULTIVATION AND MANURING OF COCONUTS IN MALAYA

(Summary of Results obtained between 1930 and 1934)

BY

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and
J. LAMBOURNE,
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In previous issues of this Journal (1) an account has been given of cultivation and manurial experiments on coconuts, with results to the end of 1932. The lay-out has been fully described and consists of sixteen 16-tree plots used to test four surface treatments: (a) cover slashed every three months, (b) cover buried to a depth of seven inches twice a year, (c) clean weeding with cultivation to a depth of seven inches twice a year, and (d) clean weeding without cultivation. Each plot is divided into four 4-tree sub-plots with the following treatments: (i) a complete manurial mixture of whale guano compound 2½ lbs., steamed bone meal 6 lbs. and muriate of potash 1½ lb. per tree (designated for convenience NPK), (ii) the complete mixture as in (i) with lime at the rate of 10 piculs (approx. 12 cwts.) per acre (LNPK), (iii) lime alone at the same rate (L), (iv) control.

Nitrogen was supplied in organic form as it was thought possible that owing to slow decomposition it might be made available for a longer period than would be the case if inorganic fertilizers, such as ammonium sulphate or calcium cyanamide, were employed. Subsequent work (2) on the nitrification of castor cake has rendered this doubtful. A complete mixture was used as it was desired to ensure that none of the three essential elements most likely to be deficient would be lacking. Repeated deep cultivation, whether of clean-weeded areas or in the process of burying the cover crop, although known to be impracticable as a commercial proposition, was given to ensure that its absence should not act as a limiting factor in these experiments.

At the inception of the experiments, variation among palms was known to be great (3) so that it was not expected that significance in any one year would be attained for differences of less than say 25 per cent. of the mean. In view of the price ruling for copra ($5 per picul), then thought to be low, this was immaterial, since smaller differences would not repay cost of treatment. As explained in previous articles, it was desired to spread the experiments over as wide a variety of soils as possible and with the means available it would have been a physical impossibility to deal with greater numbers of palms.

Since the time from flowering to maturity of nuts is approximately eleven months, it may be assumed with some confidence that yield will be unaffected by treatments or manures during the first year of the experiment and that these results may be used as additional controls for those of subsequent years. This is confirmed by another experiment on liming of a very acid soil, results of which will be published later.

Table I gives general particulars; Table II, analyses of the soils under experiment; Table III, the mean water level in drains and dates of application of manures. Table IV gives results of nut counts for the full period of the experiment.

In Table IV means for the four surface and four manurial treatments are given. It is possible, in addition, to derive sixteen means for the combinations of surface and manurial treatments; *e.g.* cover slashed — NPK — LNPK — L and — control; cover buried — NPK — LNPK — L and — control; analysis of the 1933 results shows interaction to have been absent between surface treatments and manures, and to avoid complication of Table IV these sixteen means have been omitted. The opportunity has been taken to correct a number of slips and one serious error in tables previously published.

All statistical working has been carried out by expressing yields as a percentage of the annual general mean in each case, as this facilitates comparison from year to year.

A word on "significance" may be useful. No experiment and no system of statistical analysis can give certainty to a result; all that such analysis can do is to provide an estimate of the reliability to be attached to results. In agricultural experiments when the odds are 20 to 1 against differences obtained being due to chance, such results are said to be "significant" and worthy of consideration. Whether, even if significant differences are obtained, treatments can be recommended is, of course, a matter of economics.

In analysis two tests are available, one known as the "Z" test, indicating whether or not significance exists anywhere in the results obtained and the other the "t" test, which may be extended to calculate the minimum difference required for significance between any pair of treatments and hence to find the location of the significance indicated by "Z".

In all cases for 1933 and 1931 the minimum differences for significance have been calculated, even where such differences were obviously not attained, in order to arrive at an estimate of the order of differences capable of detection in these experiments.

In border-line cases it sometimes happens that the "t" test will indicate significance where the "Z" test does not; in theory the positive evidence may be accepted, but the writers prefer to regard such cases as "not proven".

Results in the rows $y—bx$ are obtained by the method of covariance of Sanders (4), by which an estimate may be made of the part played by the permanent factors — inherent character of the palms and soil variation. The

figures in these rows do not represent hypothetical mean yields, but only that portion of the actual yield which cannot under the conditions of the experiment be assigned to permanent factors; differences shown between mean yields are therefore more likely to be due to treatment than are those in the 1932 to 1933 rows where inherent yield capacity may play a part. In an endeavour to indicate the theoretical nature of figures in this row, mean numbers of nuts have been given in whole numbers only.

It will be observed that analysis of the January—June 1934 results has not been undertaken. They reveal no new differences and the experimental error may be taken as of the same order as that of the whole of 1933, except in the case of Estate B where numbers are so small that the error is probably very great.

Size of Nuts.

Before discussing results in Table IV in detail the question of nut size must be considered.

In addition to influencing numbers of nuts produced or brought to maturity, treatments may affect the size and consequently weight of nuts or the water content of the meat.

Under the conditions of these experiments conversion of separate parcels of nuts into copra was an impossibility and an indirect method was essential. As mentioned in last year's summary, Mr. F. C. Cooke (Officer-in-Charge, Copra Investigations) showed that there was a close relationship between weight of husked nut and meat. This has subsequently been confirmed in Ceylon. Water content of meat varies within such narrow limits that this source of variation may be excluded and the assumption made that any change of resultant copra will be indicatd by change in weight of husked nuts. Unfortunately, this relationship was not proved until the latter part of 1932 so that a back check cannot be applied. During 1933 the total weight of husked nuts as well as numbers from each sub-plot were recorded on three occasions, *viz.* in February, June and October, and Table V gives mean numbers and weights. It will be seen that there are no variations of any order likely to be significant.

In order to test the reliability of three observations, the relationship of numbers recorded for three collections to those for the whole year was ascertained and found, as Table VII shows, to be close.

The weight of the mean nut for each treatment may be ascertained from the data in two ways which will not necessarily give concordant results. For the first, total (or mean) weights for each treatment may be divided by the total (or mean) numbers; for the second, the separate sub-plot totals (or means) may be employed and one "ideal" not supposed to be harvested from each sub-plot. The former method gives a mean correctly weighted for numbers of nuts and is the one of practical value, the latter gives results susceptible of statistical analysis. As Table VI shows, there are rarely serious differences between the figures obtained by the two methods. Both from the common-sense and

statistical view-points, the table shows that with one exception, large variations ascribable to treatments are absent; only in the case of Estate F does variation attain significance by both tests and then amounts to 8 per cent. only as the result of liming. This confirms the impression derived from visual comparison of numbers and weights in columns I and II, and very strongly indicates that for these experiments the only changes which need be considered are those of numbers of nuts.

Discussion of Results.

Reverting to Table IV and comparing differences in the $y—bx$ rows between pairs of manurial treatments with the minimum significant differences, it is seen that, with the exception of Estate B, neither manuring nor liming nor the combination was anywhere definitely significant. Estate B is exceptional and will be discussed separately. Estate F is a border-line case; the "Z" test shows no significance, but by the "t" test liming is just better than the control: doubt is cast on this, however, by the fact that the increase of yield from lime and manure does not attain significance.

Surface Treatments.

There are no significant differences on Estates A and G. On Estate B the two bare surface treatments, cultivation and clean-weeding, are definitely better than two treatments involving growth of a cover.

On Estate C the two bare surface treatments are just better than cover slashed but not than cover buried; the fact that such differences as occur are significant is due to the remarkably small experimental error shown on this Estate. On Estate D cultivation is just possibly better than cover buried.

Estate E. The two bare surface treatments are definitely better than cover buried and suggestively close to significance over slashed.

Estate F. Cultivation is definitely better than cover buried and just better than cover slashed; it just misses significance over bare surface without cultivation. The soil on this Estate is exceptionally heavy and these results, together with those of the effect of liming on the size of nuts, are not unexpected.

Excluding Estate B, such significant increases as have occurred are of the order of 10 per cent. of the mean, or roughly of 1 picul of copra per annum, worth say $3. Putting manufacture, collection and transport at 80 cents per picul there remains $2.20 per acre per annum. For a return such as this, cultivation is obviously out of the question, and clean weeding would cost not less than $6 per acre under the most favourable condition. It follows, therefore, that for estates on what may be called "normal" Malayan soils with palms of ages ranging from 10 to 21 years, neither manuring with any reasonable quality of manure, liming, nor any form of soil treatment studied, nor any combination of the two is likely to give economic returns. This conclusion is supported by large-scale manuring and liming trials (not capable of statistical analysis) carried out on Estate A several years ago and by experiments of several

years duration on an estate not in this list carried out by Dr. H. W. Jack (late Economic Botanist of this Department). The latter experiments were spoilt for analysis by unexpected variation in time of the plots, most likely due to sub-soil variations, but would have shown indications of large differences if such had existed.

The cover in these experiments was slashed; uncontrolled growth may possibly have resulted in greater differences.

This absence of response must be due to one or more limiting factors other than those under observation. Factors which suggest themselves are inherent yielding capacity of the unselected Malayan palm population, soil aeration, and chemical composition and water supply. Although the soils of Estates A, C—G vary among themselves, they are all heavy compared with many Ceylon coconut soils and the very sandy soils or almost pure sands of many tropical islands where coconuts are grown. Reasonable growth on "normal" Malayan coconut soils is, in fact, dependent on intensive drainage.

This heavy texture might possibly prevent sufficient aeration of the roots to permit of response to manures, and it was for this reason that cultivation was included; only on the heaviest soil of all has any marked response to cultivation been obtained, but even in this case there was no special response of the cultivated plots to manurts. It must, therefore, be concluded that, given adequate drainage, lack of soil aeration is not the obstacle which inhibits largely increased crops as the result of manuring.

Convincing proof that insufficient soil moisture is not the cause of soil lack of response in these experiments is furnished by Estate "D" which is provided with an efficient system of sub-soil irrigation. Here manures should have had free play, but have effected nothing.

Incidentally, it is puzzling to find that on this estate nut size is the smallest recorded. The writers can only suggest that the palms are, as a whole, very near the upper limit of their yield capacity under the whole congeries of soil and meteorological conditions on any given "normal" estate and cannot be materially influenced by any economic or near economic treatment.

On Estate B the situation is totally different. The trees are very old, the soil is light and poor and the property is understood to have been somewhat neglected in the past.

Yields have obviously been largely increased by keeping the surface bare and also by the application of lime and fertilizer. Examination of the sixteen sub-means set out in Table VI suggests that there may have been differential response to manures superimposed on different surface treatments and apparent confirmation is given to this by analysis of the 1933 results alone. However, when the considerable initial variation shown in 1931 is allowed for by application of covariance, this is seen to be illusory. The fact that there is no ***differential***

response does not mean that a better response is not obtained when two good treatments meet and this is indeed found to be the case, highest yields being obtained by combination of lime, fertilizer and bare surface.

From the financial standpoint it will be noted that clean weeding without manurial application gave a corrected increase of 22 nuts per palm over the corresponding cover-slashed plot, whereas the addition of lime and fertilizer gave an additional 20 nuts.

Twenty nuts per palm at 50 palms per acre and 250 nuts per picul of copra may be taken as approximately equivalent to 4 piculs—valued at $2.20 (vide page 514) per picul which gives a return of $8.80 per acre per annum in return for an expenditure of $5 or $6 for clean weeding and a similar return for a lime manurial mixture costing say $15 per acre. The former would be remunerative, the latter would not. There is some evidence, however, from another source that one application of lime may have effects lasting three or more years; if this should prove to be the case, the application would be considerably reduced in cost. The manurial mixture actually used in these experiments is relatively expensive and from what is now known could almost certainly be replaced by cheaper artificial, *e.g.* ammonium sulphate or calcium cyanamide and rock phosphate or basic slag. If cyanamide and slag were used it might be possible to dispense with additional lime and to reduce the cost of annual application to $5 or $6.

Even this one apparently financially satisfactory result is open to doubt. 1933 was a peak year everywhere; increases in 1932 were smaller and the figures for the first half of 1934 are disconcerting, the more so as the relative position of the different treatments is approximately maintained, which excludes the obvious possibility that the drop in mean yield is due to exhaustion of manures or lime. (None was applied in 1933 or 1934).

Here then the commercial feasibility of treatment in the broad sense cannot be regarded as definitely proved and judgement must be reserved until figures for the whole of 1934 are available.

The Future of the Experiments.

Records have been discontinued since the end of June 1934 on all Estates except B as it seems clear that little useful purpose will be served by continuing the experiments in their present form. The results obtained should be of value although negative, as showing directions in which waste of money can be avoided.

It is proposed to investigate the possibility of growing less dense covers than Centrosema on heavy soils under mature coconuts, in the hope that they may combine the advantages of clean-weeding with the cheapness of a cover. If these attempts are successful the experiments will be reorganised to test their effect on yield. Recording on Estate B continues and it is intended to make a fresh manurial application next year, using the cheapest possible mixture.

Summary.

An account is given of experiments in progress since 1931 on seven coconut estates.

It is shown that on 'normal' soils neither manuring, liming nor clean weeding is likely to increase yields from mature coconuts to an economic degree over those obtained from unmanured plots with cover kept under control.

On one of the Estates on poor light soil, large responses to clean-weeding and to application of manures and lime were obtained, but owing to a heavy drop in yield in the first part of 1934 definite conclusions cannot yet be drawn.

It is desired again to emphasize that the conclusion in paragraph two applies to normal areas of palms from 10 to 20 years old not over-drained.

There is some evidence that a cover may considerably retard young coconuts or older palms on over-drained soil. On an area of exceedingly acid soil (pH 2.0 to 3.5) liming has been shown to be of benefit. Such areas are fortunately not of frequent occurrence.

The writers wish to express their thanks to the managers of the estates on which these experiments were carried out for continued help freely given, and to Che Shaffie bin Mohamed Taib, Che Abdul Malik bin Abdul Pakih and Che Abdul Chaffar bin Sidek for their care in the labourious task of recording.

Appendix.

For the benefit of the statistically minded Table VII, giving standard deviations etc., is appended. It should be explained that one of us only (W.N.C.B.) must bear the blame for errors of computation which may have occurred in the tables and analyses.

It will be noted that instead of "Z"—a "Z ratio" is given; this is the ratio of the appropriate variances and is that number of which half the natural logarithm is Z. The writer personally has found it easier once and for all to construct a table of numbers corresponding to Fisher's table of "Z" and use these. The necessity at the end of a long calculation to have recourse to log tables is, again personally, peculiarly irritating.

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Table I.

Estate.	Locality.	Age of palms at commencement of experiment.	Type of soil.	Treatment before experiment started.	Type of cover employed in experiment.
A	Banting	21 years	Alluvial clay loam	Clean weeded	Grass and weeds
B	Province Wellesley-North	Unknown, very old	Sandy soil over white silt	Under grass	Grass
C	Province Wellesley-South	20 years	Heavy clay	Under *Centrosema pubescens* and grass ploughed in at intervals	*Centrosema* and grass
D	Krian District	20 years	Friable clay loam	Clean weeded	*Centrosema* and *Mikania scandens*
E	Bagan Datoh	20 years	Heavy clay	Grass, *Centrosema* and fern	Grass, *Centrosema* and fern
F	Sabak Bernam	17 years	Very heavy clay	Leguminous covers and weeds. Block 4 *Centrosema* and grass	Grass and leguminous covers Blocks 1-3 *Centrosema* in Block 4
G	Sepang	10—11 years	Peat overlying heavy clay	3 blocks under weeds and fern. 1 Block *Mikania scandens*	3 blocks under weeds and fern. 1 block under *Mikania scandens*

Table II.
Soil Analysis

		Physical						Chemical							
								pH		Oven dried per cent.		Ignited per cent.			
		Gravel	Coarse sand	Fine sand	Silt	Clay	Loss on Ignition	Sus-pension	Filtrate	Carbon	Nitrogen	CaO	Sesqui Oxides	K_2O	P_2O_5
				Per Cent.											
Estate A	Top Soil	Nil	Nil	27	30	41	11	4.3	6.0	3.56	0.220	0.088	13.40	0.718	0.044
	Sub „	„	„	21	27	53	9	3.9	4.8	2.55	0.150	0.043	15.22	0.742	0.032
Estate B	Top Soil	6	31	23	18	18	4	4.5	6.6	1.31	0.105	0.045	11.22	0.201	0.024
	Sub „	6	33	18	19	21	5	5.0	7.0	1.14	0.080	0.038	10.79	0.209	0.021
Estate C	Top Soil	2	7	20	30	43	6	4.8	6.8	2.47	0.171	0.085	13.89	0.638	0.158
	Soil „	2	8	27	24	39	8	5.0	7.0	2.36	0.143	0.121	12.47	0.549	0.087
Estate D	Top Soil	Nil	Nil	24	34	37	12	4.3	6.2	4.25	0.224	0.136	14.73	0.681	0.087
	Sub „	„	„	17	41	43	11	3.8	6.0	4.02	0.213	0.196	13.85	0.598	0.229
Estate E	Top Soil	Nil	Nil	2	29	70	13	4.0	6.8	2.43	0.238	0.196	24.23	0.921	0.075
	Sub „	„	„	3	29	69	12	4.6	6.6	3.05	0.210	0.070	23.35	1.101	0.075
Estate F	Top Soil	Nil	Nil	2	31	68	11	4.4	7.0	1.74	0.164	0.091	21.14	0.628	0.049
	Sub „	„	„	1	32	68	9	4.4	6.8	1.11	0.098	0.039	21.41	0.683	0.031
Estate G	Top Soil	Nil	not determined Nil	32	32	37	26	4.0	5.0	10.99	0.388	0.165	8.73	0.518	0.064
	Sub „						17	3.7	5.6	6.72	0.259	0.072	13.85	0.713	0.057

Table III.

Estate.	Mean water level in drains.	Dates of Application of Manures.			
		1st application.		2nd application.	
A	2½-3 ft.	11.7.30	31.7.30	—7.31	—8.31
B	2 -3 ft.	5.1.31	9.2.31	18.1.32	22.2.32
C	2½-3¾ ft.	4.3.31	24.3.31	23.2.32	19.2.32
D	2-2½ ft.	6.1.31	20.2.31	5.1.32	24.2.32
E	2 ft.	8.1.31	12.2.31	8.2.32	26.2.32
F	2-4 or 5 ft.	9.1.31	13.2.31	9.2.32	27.2.32
G	4 -5 ft.	26.1.31	23.2.31	31.1.32	9.3.32
				9.8.32	30.8.32

Table IV.
Results of Nut Counts.
Estate A.

		Cover slashed	Cover buried	Clean weeded & cultivated	Clean weeded only	Minimum difference for significance between any pair of treatments	N P K	L N P K	Lime	Control	Minimum difference for significance between any pair of treatments	Minimum increase for significance over control	General Mean Nuts per Palm
1931	Percentage of General Mean	98.0	106.6	99.4	95.4	23.6	99.3	103.2	94.1	103.4	17.9	10.8	
	Nuts per Palm	*54.1*	*58.1*	*54.7*	*52.8*		*55.0*	*56.9*	*52.0*	*57.1*			*55.2*
1932	Percentage of General Mean	95.5	99.3	102.1	103.2		92.0	104.0	102.3	101.7			
	Nuts per Palm	*45.2*	*48.3*	*48.8*	*47.0*		*43.5*	*49.2*	*48.5*	*48.3*			*47.4*
1933	Percentage of General Mean	100.6	102.3	96.6	100.6	26.6 "Z" not significant	98.0	111.1	94.0	97.0	14.3	8.5 "Z" not significant	
	Nuts per Palm	*64.7*	*65.7*	*62.1*	*64.6*		*63.0*	*71.4*	*60.5*	*62.3*			*64.3*
First half 1934	Percentage of General Mean	101.7	96.5	108.8	92.9		89.3	108.4	103.6	98.6			
	Nuts per Palm	*23.7*	*22.5*	*25.1*	*21.7*		*20.8*	*25.3*	*24.2*	*23.0*			*23.3*
y-bx 1933/31	Percentage of 1933 Mean	42.6	38.1	34.3	40.8	20.5 "Z" not significant	57.0	69.5	57.4	54.1	16.6	12.1 "Z" not significant	
	Nuts per Palm	*28*	*26*	*22*	*27*		*37*	*45*	*37*	*35*			

Estate B.

		Cover slashed	Cover buried	Clean weeded & cultivated	Clean weeded only	Minimum difference for significance between any pair of treatments	N P K	L N P K	Lime	Control	Minimum difference for significance between any pair of treatments	Minimum increase for significance over control	General Mean Nuts per Palm
1931	Percentage of General Mean	87.2	118.2	97.7	96.9	71.0	86.6	98.1	87.7	127.6	55.0		
	Nuts per Palm	*11.3*	*15.3*	*12.7*	*12.6*		*11.3*	*12.8*	*11.4*	*16.7*			*13.0*
1932	Percentage of General Mean	86.5	87.1	132.8	93.7	31.4	96.7	111.3	91.4	100.5		22.8	
	Nuts per Palm	*20.2*	*21.1*	*31.0*	*20.3*		*22.6*	*25.9*	*21.3*	*23.5*			*23.4*
1933	Percentage of General Mean	55.0	80.0	135.8	129.4	39.0 "Z" not significant	88.7	120.1	98.8	92.5	20.6 "Z" just significant	16.8	
	Nuts per Palm	*20.9*	*30.4*	*51.6*	*49.2*		*33.7*	*45.7*	37.5	35.2			*38.0*
First half 1934	Percentage of General Mean	72.1	78.5	130.1	118.7		97.3	116.9	93.4	92.0			
	Nuts per Palm	*4.9*	*5.4*	*8.9*	*8.1*		*6.7*	*8.0*	*6.4*	*6.3*			*6.8*
y-bx 1933/31	Percentage of 1933 Mean	11.4	20.9	96.9	81.0	18.4 "Z" significant	69.6	98.4	79.4	64.4	16.9 "Z" significant	13.7	
	Nuts per Palm	*4*	*8*	*37*	*31*								

Estate C

		Cover slashed	Cover buried	Clean weeded & cultivated	Clean weeded only	Minimum difference for significance between any pair of treatments	N P K	L N P K	Lime	Control	Minimum difference for significance between any pair of treatments	Minimum increase for significance over control	General Mean Nuts per Palm
1931	Percentage of General Mean	101.1	96.8	102.7	98.9	6.8 "Z" not significant	101.1	94.8	103.2	100.5	8.3 "Z" not significant	6.8	
	Nuts per Palm	*88.9*	*85.0*	*90.3*	*86.7*		*88.9*	*83.1*	*90.2*	*88.1*			*87.6*
1932	Percentage of General Mean	92.3	98.0	103.5	106.2		104.2	92.4	101.4	102.0			
	Nuts per Palm	*81.9*	*87.0*	*92.1*	*94.0*		*92.6*	*81.8*	*90.0*	*90.5*			*88.7*
1933	Percentage of General Mean	95.7	95.7	105.0	103.6	7.9 "Z" not significant	101.3	93.0	107.8	97.9	11.6 "Z" not significant	9.5	
	Nuts per Palm	*96.2*	*96.2*	*105.7*	*104.3*		*102.0*	*93.6*	*108.5*	*98.6*			*100.6*
First half 1934	Percentage of General Mean	99.7	92.9	106.8	100.4		106.2	94.5	99.1	100.1			
	Nuts per Palm	*41.1*	*38.3*	*44.5*	*41.4*		*43.8*	*39.0*	*40.9*	*41.3*			*41.2*
y-bx 1933/31	Percentage of 1933 Mean	44.2	48.3	52.7	52.3	6.8 "Z" significant	9.3	6.6	13.7	6.4	8.4 "Z" not significant	6.9	
	Nuts per Palm	*44*	*48*	*53*	*52*		*10*	*7*	*14*	*7*			

Estate D.

		Cover slashed	Cover buried	Clean weeded & cultivated	Clean weeded only	Minimum difference for significance between any pair of treatments	N P K	L N P K	Lime	Control	Minimum difference for significance between any pair of treatments	Minimum increase for significance over control	General Mean Nuts per Palm
1931	Percentage of General Mean	91.4	107.0	102.5	99.1	16.0 "Z" not significant	94.7	101.7	98.1	105.4	15.0	12.1	
	Nuts per Palm	*63.2*	*73.0*	*70.0*	*67.7*		*64.5*	*69.9*	*67.9*	*71.9*			*68.1*
1932	Percentage of General Mean	84.9	101.1	113.5	100.5	16.9 "Z" not significant	89.6	99.3	104.0	107.0	18.5 "Z" not significant	15.0	
	Nuts per Palm	*55.2*	*65.9*	*74.9*	*65.5*		*58.2*	*64.5*	*67.6*	*69.8*			*65.2*
1933	Percentage of General Mean	94.0	95.0	110.5	100.2	20.4 "Z" not significant	100.2	105.0	94.3	100.4	12.5 "Z" not significant	10.2	
	Nuts per Palm	*75.1*	*76.1*	*88.6*	*80.2*		*80.2*	*84.0*	*75.3*	*80.6*			*79.9*
First half 1934	Percentage of General Mean	91.8	92.3	109.6	106.2		92.2	103.1	104.1	101.5			
	Nuts per Palm	*31.1*	*31.3*	*37.6*	*36.0*		*31.2*	*34.9*	*35.4*	*34.3*			*33.9*
y-bx 1933/31	Percentage of 1933 Mean	35.8	21.5	44.8	37.1	18.8 "Z" not significant	51.1	82.1	43.6	45.5	9.5 "Z" not significant	7.8	
	Nuts per Palm	*28*	*17*	*35*	*30*		*41*	*41*	*35*	*36*			

Estate E.

		Cover slashed	Cover buried	Clean weeded & cultivated	Clean weeded only	Minimum difference for significance between any pair of treatments	N P K	L N P K	Lime	Control	Minimum difference for significance between any pair of treatments	Minimum increase for significance over control	General Mean Nuts per Palm
1931	Percentage of General Mean	102.8	96.8	103.2	97.1	19.3 "Z" not significant	97.5	105.0	95.5	101.8			
	Nuts per Palm	*76.7*	*72.1*	*77.2*	*72.4*		*72.7*	*78.4*	*71.1*	*75.1*			*74.6*
1932	Percentage of General Mean	100.1	100.6	102.4	96.8		98.2	99.0	93.1	109.7			
	Nuts per Palm	*64.7*	*65.0*	*66.1*	*62.6*		*63.5*	*64.1*	*60.1*	*70.6*			*64.7*
1933	Percentage of General Mean	97.1	90.5	107.2	105.2	15.6 "Z" not significant	96.5	105.1	94.2	104.1	11.5 "Z" just significant	9.1	
	Nuts per Palm	*69.5*	*76.8*	*75.0*	*64.8*		*69.1*	*75.3*	*67.5*	*74.6*			*71.6*
First half 1934	Percentage of General Mean	89.3	90.1	106.7	113.9		97.5	103.6	96.0	103.0			
	Nuts per Palm	*29.5*	*29.7*	*35.2*	*37.5*		*32.1*	*34.1*	*31.6*	*33.4*			*33.0*
y-bx 1933/31	Percentage of 1933 Mean	48.0	43.2	59.1	58.6	11.8 "Z" not significant	Not determined, obviously no increase over control.						
	Nuts per Palm	*34*	*31*	*42*	*42*								

Estate F.

		Cover slashed	Cover buried	Clean weeded & cultivated	Clean weeded only	Minimum difference for significance between any pair of treatments	N P K	I. N P K	Lime	Control	Minimum difference for significance between any pair of treatments	Minimum increase for significance over control	General Mean Nuts per Palm
1931	Percentage of General Mean	103.6	98.9	105.2	92.8	30.8 "Z" not significant	100.7	91.0	103.1	104.8	20.1 "Z" not significant	15.9	
	Nuts per Palm	49.9	47.7	50.6	44.5		48.5	43.9	49.6	50.6			48.1
1932	Percentage of General Mean	98.3	89.9	117.0	94.9		101.8	98.2	106.0	93.7			
	Nuts per Palm	45.3	41.4	53.9	43.7		46.9	45.2	49.0	43.2			46.1
1933	Percentage of General Mean	98.9	86.4	119.6	95.1	26.4 "Z" not significant	98.4	97.3	110.8	93.5	19.3 "Z" not significant	15.4	
	Nuts per Palm	49.9	43.6	60.3	48.0		49.7	49.1	55.9	47.0			50.5
First half 1934	Percentage of General Mean	100.0	87.6	112.9	99.4		101.2	96.5	106.0	96.3			
	Nuts per Palm	22.0	19.6	25.3	22.3		22.7	21.6	23.8	21.6			22.4
y-bx 1933/31	Percentage of 1933 Mean	38.9	29.0	58.6	41.6	17.7 "Z" significant	37.9	42.6	48.8	30.8	14.6 "Z" not significant	11.8	
	Nuts per Palm	20	15	30	21		19	22	25	16			

Estate G.

		Cover slashed	Cover buried	Clean weeded & cultivated	Clean weeded only	Minimum difference for significance between any pair of treatments	N P K	L N P K	Lime	Control	Minimum difference for significance between any pair of treatments	Minimum increase for significance over control	General Mean Nuts per Palm
1931	Percentage of General Mean	102.3	102.4	98.4	96.9	40.5 "Z" not significant	101.9	96.8	103.2	98.1	24.4 "Z" not significant	19.8	
	Nuts per Palm	*47.3*	*47.4*	*45.5*	*44.8*		*47.1*	*44.5*	*47.7*	*45.3*			*46.1*
1932	Percentage of General Mean	97.0	99.7	93.6	108.8		96.5	101.0	100.6	101.8			
	Nuts per Palm	*53.6*	*55.1*	*51.7*	*60.7*		*53.3*	*55.8*	*55.6*	*56.3*			*55.3*
1933	Percentage of General Mean	96.3	100.6	100.7	102.2	40.2 "Z" not significant	98.3	100.8	100.1	100.7	19.8 "Z" not significant	16.2	
	Nuts per Palm	*50.9*	*53.2*	*53.2*	*54.8*		*52.1*	*53.2*	*52.9*	*53.2*			*52.8*
First half 1934	Percentage of General Mean	91.1	101.4	96.4	101.1		93.7	105.7	95.2	105.3			
	Nuts per Palm	*13.5*	*15.1*	*14.3*	*16.7*		*13.9*	*15.7*	*14.1*	*15.6*			*14.9*
y-bx 1933/31	Percentage of 1933 Mean	26.9	31.1	33.9	36.6	24.8 "Z" not significant	49.0	54.3	50.1	53.0	15.7 "Z" not significant	12.8	
	Nuts per Palm	*14*	*16*	*18*	*19*		*26*	*28*	*26*	*28*			

Table V.

Results of Three Harvests during 1933.

Estate A.

		Cover slashed	Cover buried	Clean weeded & cultivated	Clean weeded only	Minimum difference for significance	N P K	L N P K	Lime	Control	Minimum difference for significance	General Mean
No. of nuts	Percentage of General Mean	98.7	104.1	103.0	94.0		91.8	104.1	97.8	106.2		
	Nuts per Palm	*15.5*	*16.3*	*16.1*	*14.7*		*14.4*	*16.3*	*15.3*	*16.6*		15.7
Weight of nuts.	Percentage of General Mean	104.7	97.6	104.5	92.4		94.5	104.4	100.4	99.8		
	Pounds per Palm	*39.5*	*36.9*	*39.5*	*34.9*		*35.7*	*39.4*	*37.9*	*37.7*		37.7 lbs.
Unit weight of nut. Pounds Derived from Means		2.54	2.26	2.46	2.37		2.48	2.43	2.51	2.27		2.40 lbs.
Unit weight of "ideal" nut Pounds		2.56	2.46	·2.42	2.32	0.29 "Z" not significant	2.51	2.41	2.49	2.30	0.20 "Z" not significant	2.43 lbs.

Estate B.

		Cover slashed	Cover buried	Clean weeded & cultivated	Clean weeded only	Minimum difference for significance	N P K	L N P K	Lime	Control	Minimum difference for significance	General Mean
No. of nuts	Percentage of General Mean	61.1	78.7	134.6	125.6		100.0	112.5	88.1	99.3		
	Nuts per Palm	*5.0*	*11.1*	*10.4*	*6.5*		*8.3*	*9.3*	*7.3*	*8.2*		*8.3*
Weight of nuts.	Percentage of General Mean	64.2	83.0	127.0	125.5		98.1	116.6	94.1	90.6		
	Pounds per Palm	*11.9*	*23.4*	*23.1*	*15.3*		*18.0*	*21.5*	*17.4*	*16.7*		*18.4*
Unit weight of nut.	Pounds Derived from Means	2.38	2.11	2.22	2.32		2.16	2.31	2.38	2.03		2.21
Unit weight of "ideal" nut	Pounds	2.35	2.35	2.30	2.30	0.40 "Z" not significant	2.28	2.30	2.45	2.27	0.18 0.14 "Z" not significant	2.33

Estate C.

		Cover slashed	Cover buried	Clean weeded & cultivated	Clean weeded only	Minimum difference for significance	N P K	L N P K	Lime	Control	Minsmum difference for significance	General Mean
No. of nuts	Percentage of General Mean	89.3	100.0	103.7	107.0		100.5	91.0	109.4	99.2		
	Nuts per Palm	*21.5*	*24.2*	*25.6*	*25.8*		*24.5*	*22.1*	*26.2*	*24.0*		*24.2*
Weight of nuts.	Percentage of General Mean	94.2	95.3	104.8	105.6		98.2	90.9	108.4	102.6		
	Pounds per Palm	*45.2*	*45.8*	*50.4*	*50.8*		*47.2*	*43.7*	*52.1*	*49.3*		*48.1*
Unit weight of nut.	Pounds Derived from Means	2.10	1.89	1.97	1.97		1.93	1.98	2.06	2.05		1.99
Unit weight of "ideal" nut	Pounds	2.10	1.89	1.98	2.03	0.36 "Z" not significant	1.94	1.99	1.98	2.18	0.13 0.11 "Z" not significant	2.00

Estate D.

		Cover slashed	Cover buried	Clean weeded & cultivated	Clean weeded only	Minimum difference for significance	N P K	L N P K	Lime	Control	Minimum difference for significance	General Mean
No. of nuts	Percentage of General Mean	93.7	86.5	107.5	112.5		93.3	97.8	99.4	109.6		
	Nuts per Palm	15.6	14.4	17.9	18.8		15.6	16.3	16.6	18.2		16.7
Weight of nuts.	Percentage of General Mean	93.6	84.0	113.1	109.3		90.2	98.4	102.8	108.7		
	Pounds per Palm	28.8	25.8	34.7	35.5		27.7	30.2	31.6	33.4		30.8
Unit weight of nut.	Pounds Derived from Means	1.84	1.79	1.94	1.87		1.77	1.86	1.90	1.89		1.84
Unit weight of "ideal" nut	Pounds	1.86	1.78	1.95	1.79	0.33 "Z" not significant	1.77	1.87	1.92	1.83	0.15 0.13 "Z" not significant	1.85

Estate E.

		Cover slashed	Cover buried	Clean weeded & cultivated	Clean weeded only	Minimum difference for significance	N P K	L N P K	Lime	Control	Minimum difference for significance	General Mean
No. of nuts	Percentage of General Mean	104.6	89.0	105.3	101.2		97.9	108.1	96.1	98.1		
	Nuts per Palm	*17.9*	*15.2*	*17.9*	*17.2*		*16.7*	*18.3*	*16.3*	*16.7*		*17.1*
Weight of nuts.	Percentage of General Mean	109.1	88.9	104.5	97.6		97.5	104.8	95.6	101.6		
	Pounds per Palm	*41.7*	*34.3*	*40.4*	*37.4*		*37.4*	*40.2*	*36.7*	*38.9*		*38.3*
Unit weight of nut. Pounds Derived from Means		2.33	2.25	2.24	2.18		2.24	2.20	2.26	2.32		2.24
Unit weight of "ideal" nut Pounds		Not calculated, differences small.										

Estate F.

		Cover slashed	Cover buried	Clean weeded & cultivated	Clean weeded only	Minimum difference for significance	N P K	L N P K	Lime	Control	Minimum difference for significance	General Mean
No. of nuts	Percentage of General Mean	91.8	81.5	129.0	98.4		100.8	97.6	109.6	91.9		
	Nuts per Palm	*10.8*	*9.7*	*15.3*	*11.7*		*11.9*	*11.6*	*13.0*	*10.9*		*11.9*
Weight of nuts.	Percentage of General Mean	96.6	81.0	125.4	96.9		96.5	101.3	112.5	89.3		
	Pounds per Palm	*26.1*	*21.9*	*33.8*	*26.1*		*26.0*	*27.3*	*30.3*	*24.1*		*27.0*
Unit weight of nut. Pounds Derived from Means		2.39	2.25	2.21	2.23		2.18	2.35	2.33	2.21		2.27
Unit weight of "ideal" nut Pounds		2.43	2.25	2.21	2.23	0.57 "Z" not significant	2.18	2.41	2.37	2.19	0.181 .014 "Z" not significant	2.29

Estate G.

		Cover slashed	Cover buried	Clean weeded & cultivated	Clean weeded only	Minimum difference for significance	N P K.	L N P K	Lime	Control	Minsmum difference for significance	General Mean
No. of nuts	Percentage of General Mean	97.0	100.8	97.1	105.2		100.8	96.4	101.2	101.7		
	Nuts per Palm	*12.9*	*13.4*	*12.9*	*13.9*		*13.4*	*12.8*	*13.4*	*13.1*		*13.3*
Weight of nuts.	Percentage of General Mean	93.4	101.0	106.2	99.3		104.2	98.2	98.5	99.3		
	Pounds per Palm	*35.4*	*38.3*	*40.3*	*37.7*		*39.6*	*37.2*	*37.4*	*37.7*		*37.9*
Unit weight of nut.	Pounds Derived from Means	2.74	2.89	2.96	2.90		3.00	2.84	2.79	2.88		2.81
Unit weight of "ideal" nut	Pounds	2.74	2.76	2.84	2.81	0.41 "Z" not significant	2.80	2.90	2.74	2.72	0.23 0.18 "Z" not significant	2.79

Table VI.
Sub-means of Estate B.

	Cover Slashed		Cover buried		Clean weeded & Cultivated		Clean weeded	
	Percentage of General Mean	Nuts per palm	Percentage of General Mean	Nuts per palm	Percentage of General Mean	Nuts per palm	Percentage of General Mean	Nuts per palm
			1931					
N P K	100.7	13.2	85.4	11.2	59.2	7.8	100.0	13.1
L N P K	107.9	14.1	49.6	6.5	147.5	19.3	93.1	12.2
Lime	66.8	8.8	155.6	20.4	62.5	8.2	63.5	8.3
Control	73.5	15.4	179.0	23.4	125.5	16.4	130.3	12.1
			1933					
N P K	56.9	21.6	58.4	22.2	111.9	42.6	127.6	48.5
L N P K	74.5	28.3	73.0	27.8	182.3	69.3	150.7	57.3
Lime	47.8	18.2	100.3	38.1	110.5	42.0	136.4	51.9
Control	55.0	15.5	87.9	33.4	138.4	52.6	102.9	39.1
			First half 1934.					
N P K	78.6	5.4	43.0	2.9	106.0	7.3	161.7	11.1
L N P K	99.6	6.8	77.7	5.3	188.3	12.9	102.3	7.0
Lime	50.3	3.4	116.1	7.9	97.8	6.7	109.2	7.5
Control	60.3	4.1	77.7	5.3	128.9	8.8	101.5	6.9
			y-bx 1934/31.					
N P K	39.1	15	43.3	16	101.4	38	109.9	42
L N P K	55.5	21	72.1	27	156.2	59	134.3	51
Lime	36.0	14	72.8	28	99.4	38	125.2	48
Control	42.0	16	56.2	21	116.2	44	89.8	34

Z for interaction, *i.e.* differential response, is not significant.

Table VII

Giving Certain Values derived by Statistical Analysis.

		Surface Treatments	Manurial Treatments
		Estate A.	
Nut Counts 1931	Standard Deviation	13.0 %	24.2 %
Nut Counts 1933	S D	14.7	19.3
	Z r	0.51 (3.9 for significance)	0.52 (2.9 for significance)
$y\text{-}bx \frac{33}{31}$	b	+ 0.61	+ 0.40
	S D	11.8	16.6
	Z r	0.27 (4.1 for significance)	2.6 (2.9 for significance)
1933 $\frac{\text{3 harvests}}{\text{12 harvests}}$	b	+ 0.92	+ 1.05
1933 Unit weight	S D	0.18	0.27
	Z r	1.01 (3.9 for significance)	1.95 (2.9 for significance)
		Estate B.	
Nut Counts 1931	S D	40.9	74.3
Nut Counts 1933	S D	21.8	27.8
	Z r	3.9	2.8
$y\text{-}bx \frac{33}{31}$	b	+ 0.41	+ 0.22
	S D	10.6	22.8
	Z r	52.1	6.8
1933 $\frac{\text{3 harvests}}{\text{12 harvests}}$	b	+ 1.03	+ 1.05
1933 Unit weight	S D	0.23	0.24
	Z r	0.80	1.82
		Estate C.	
Nut Counts 1931	S D	3.9	11.3
	Z r	1.8	1.6

			Surface Treatments	Manurial Treatments
Nut Counts 1933	S D		4.6	15.7
	Z r		4.8	2.5
y-bx $\frac{33}{31}$	b	+	0.51	+ 0.91
	S D		3.9	11.4
	Z r		5.2	1.7
1933 $\frac{\text{3 harvests}}{\text{12 harvests}}$	b	+	0.33	+ 1.20
1933 Unit weight	S D		0.21	0.18
	Z r		2.85	1.69
			Estate D.	
Nut Counts 1931	S D		9.2	20.3
	Z r		2.02	0.82
Nut Counts 1933	S D		11.7	16.9
	Z r		1.66	1.09
y-bx $\frac{33}{31}$	b	+	0.64	+ 0.52
	S D		9.7	12.8
	Z r		2.62	1.74
1933 $\frac{\text{3 harvests}}{\text{12 harvests}}$	b	+	1.01	+ 0.80
1933 Unit weight	S D		0.19	0.21
	Z r		1.90	1.41
			Estate E.	
Nut Counts 1931	S D		11.2	
	Z r		0.39	
Nut Counts 1933	S D		9.0	15.2
	Z r		2.95	2.6
y-bx $\frac{33}{31}$	b	+	0.48	
	S D		6.8	not determined.
	Z r		4.2	

		Surface Treatments	Manurial Treatments
1933 $\frac{\text{3 harvests}}{\text{12 harvests}}$	b	+ 0.72	+ 0.70
1933 Unit weight	S D Z r	not	determined.
		Estate F.	
Nut Counts 1931	S D Z r	17.7 0.43	27.3 0.59
Nut Counts 1933	S D Z r	15.2 3.43	26.0 1.32
$y\text{-}bx\ \frac{33}{31}$	b	+ 0.58	+ 0.60
	S D Z r	10.2 *6.26*	19.3 1.32
1933 $\frac{\text{3 harvests}}{\text{12 harvests}}$	b	+ 0.82	+ 0.79
1933 Unit weight	S D Z r	0.33 1.53	0.24 *4.12*
		Estate G.	
Nut Counts 1931	S D Z r	23.3 0.05	33.3 0.09
Nut Counts 1933	S D Z r	23.2 0.05	27.0 0.29
$y\text{-}bx\ \frac{33}{31}$	b	+ 0.68	0.48
	S D Z r	14.2 0.28	21.3 0.65
1933 $\frac{\text{3 harvests}}{\text{12 harvests}}$	b	+ 1.28	+ 0.77
1933 Unit weight	S D Z r	0.23 0.53	0.31 1.16

THE RELATIONSHIP BETWEEN WEIGHTS OF COCONUTS, HUSKED NUTS AND "MEAT"

BY

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The reason for this investigation has been explained on the third page of the preceding paper in this number on Cultivation and Manuring of Coconuts; the work was carried out in 1932. In *Tropical Agriculturist* for February, 1934, the results of a similar investigation are given by Pieris.

Procedure.

In carrying out these investigations a total of 936 freshly collected coconuts from three estates have been weighed to the nearest gramme, individually, nut by nut; each coconut in turn was weighed, husked, weighed again, and split, after which the meaty tissue in the half nuts was gouged out and the pieces were carefully collected and weighed.

On the first estate, an area of healthy palms, 18 years old, yielding large nuts, was selected and from the crop, indiscriminately collected from the palms, only the fully ripe, brown nuts were selected for examination. In all 400 nuts were examined on this estate.

The same procedure was repeated on the second estate where a good yielding block was selected and 430 ripe brown nuts, indiscriminately collected from a block of palms 17 years old, were examined.

On the third estate, the procedure was varied. In this instance 106 coconuts, of mixed ripeness, collected from an area planted 32 years previously and yielding small nuts, were examined.

Finally, 100 husked nuts of mixed ripeness collected from various small holdings in the coastal district of Kuala Selangor were weighed, split and weighed again; after which the meat was extracted and weighed. The object in this instance was to ascertain whether nuts grown under a wide range of conditions would show a wider range of variability and whether it was necessary to split the husked nuts in order to rule out possible variation due to the amount of water contained in each nut.

The relevant figures are as follows:—

	Mean Weight grammes	*Standard Deviation*
First Estate (400 nuts)		
Fruit	1882	± 283
Husked nut	1227	± 236
Meat	515	± 81

	Mean Weight grammes	Standard Deviation
Coefficient of correlation		
$\frac{\text{Fruit}}{\text{Meat}}$	+ 0.767	
$\frac{\text{Husked Nut}}{\text{Meat}}$	+ 0.770	
Second Estate (430 nuts)		
Fruit	1809	± 289
Husked nut	1212	± 208
Meat	510	± 87
Coefficient of correlation		
$\frac{\text{Fruit}}{\text{Meat}}$	+ 0.704	
$\frac{\text{Husked Nut}}{\text{Meat}}$	+ 0.817	
Third Estate (106 nuts)		
Fruit	1783	± 258
Husked Nut	1114	± 197
Meat	467	± 61
Coefficient of correlation		
$\frac{\text{Fruit}}{\text{Meat}}$	+ 0.676	
$\frac{\text{Husked Nut}}{\text{Meat}}$	+ 0.762	
Kampong (100 nuts)		
Fruit	Not available	—
Nuts, husked	1081	± 187
Nuts, husked and split	734	± 107
Meat	464	± 79
Coefficient of correlation		
$\frac{\text{Nuts}}{\text{Meat}}$	+ 0.840	
$\frac{\text{Split Nuts}}{\text{Meat}}$	+ 879	

It will be seen that there is high correlation especially between weight of husked nut and meat and that the splitting of nuts is not essential.

NOTES ON THE OIL PALM IN MALAYA WITH SPECIAL REFERENCE TO FLORAL MORPHOLOGY

BY

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In preparation for a series of experiments in connexion with pollination of oil palms, notes were made on the general structure and habits of growth of the oil palm in Malaya; in particular, careful observations were made on the appearance and subsequent development of the male and female inflorescences including details of the morphology of male and female flowers and the development of the fruit.

The oil palms grown on estates in Malaya are of the "Deli" type (*Elaeis guineensis* var *communis*, forma * *dura*, *Becc.*) and it is with such palms that these observations and experiments are concerned.

The climate of Malaya, with an average annual rainfall of from 80 to over 100 inches and a mean daily temperature of about 80°F, provides very favourable conditions for the growth of oil palms (1) (2).

A member of the natural order Palmae, and closely related to the coconut palm, the oil palm, though at first somewhat slower in growth than the former, usually also attains considerable height. Some palms, however, form very thick stems with proportionately reduced upward growth.

The erect columnar stem, is usually between 18 inches and 24 inches in diameter and is said to be capable of reaching heights of between 50 and 100 feet. (2) (3) (4).

The average height of stems of 10 year old palms in local estates is about 10 feet, but apart from differences of type, heights of palms may vary a good deal according to the fertility of soil.

The palms are monoecious, and the usually unisexual inflorescences are produced in the axils of the leaves.

Palms usually come into bearing about the fourth year after planting, that is, when between four and five years old, and reach maturity between the tenth and twelth years.

From the seedling stage up to the age of about 5 years, the young palm has a very bush-like appearance with a large number of leaves on a stem which is still so short that the tips of the oldest leaves often touch the ground, as they hang outwards.

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* The writer has not seen a copy of Beccari's work published in 1914, (13) but hé is usually quoted as giving *dura* the importance of a "sub-variety". The above modification follows Janssen's use of "forme", (14) but with more limited application of his *forme dura*, and, is more correct, the writer thinks, in view of the parallel variation in thickness of shell in all varieties of *Elaeis*.

As the plam grows, it assumes a more typical appearance with pillar-like stem and a terminal crown of large elliptic, pinnate leaves. The youngest leaves in the centre of the crown are erect while the older leaves, in succession, hang further outwards all round, the oldest leaves hanging obliquely downwards.

The fresh leaves are dark green in colour and on mature palms are 16 to 22 feet long, including petiole.

The petioles are between 3 and 4 feet long, about 2 inches across at the distal end and widening downwards until greatly broadened at the base. They are tough, plano-convex in section, and are armed along both edges with short strong thorns, which at an earlier stage were the bases of the ribs of fibrous sheaths protecting the shoot.

It is very noticeable that palms differ as regards the colour of their petioles, some being green and some brown, while others are of an intermediate shade or shades.

Some investigators have found a correlation between green petioles and high yield (9) which has not been found locally.

The pinnae are attached to the rachis of the leaf in two slightly divergent ranks on each side; they are 1 to 2 inches wide and are 30 to 40 inches long at the widest part of the leaf, a little beyond half-way from the petiole to the tip, and successively shorter towards each end; and they are turned gradually more forwards or upwards towards the tip.

The pinnae on the right-hand side (facing the palm) of a mature leaf are usually an inch or so longer than the pinnae on the other side.

The time at which a young leaf commences to open out its laterally-compressed pinnae may be regarded as the occasion of its first appearance as a young leaf in the centre of the crown. (7).

Normally, leaves wither about 18 to 21 months from this first appearance, having become in that time the oldest leaves at the bottom of the crown and being no longer required by the palm.

In the particular case of a leaf subtending a fruit bunch, the leaf dies a month or two after the fruits have ripened.

Dead leaves, particularly when the palms are fairly young, do not readily fall away owing to the tough sheathing bases of the petioles adhering tenaciously to the stem, overlapping one another. They gradually wither and disintegrate, leaving a portion of the base of the petiole on the stem of the palm.

The usual practice on estates is to cut off all dead leaves, and any others immediately below or supporting a ripe bunch, in order to facilitate harvesting and inspection.

Excessive pruning or damage to leaves, however, reduces the total area of leaf surface and therefore curtails the supply of carbohydrate food material which is formed in the leaves by the assimilation of carbon dioxide from the air. This has an adverse effect on the development of fruit bunches. It also has the effect of accelerating the production of young leaves, which causes an

increased rate of growth in height, necessarily at the expense of the girth of the stem then being formed. It thus causes attenuation of the stem, as well as a reduction in the reserves and the strength of the palm, from the effects of which it may not quickly recover, especially if the palm is immature. (10).

From the age of about 10 years the palm has a crown of from 30 to 50 leaves with a spread of from 25 to 30 feet in diameter and produces from 18 to 30 new leaves per annum, in either clockwise or anti-clockwise direction, more usually the latter, at intervals of approximately 137° so that eight oblique series of leaves are formed up the stem of the palm. (3) (5).

In the axils of between 60 and 70 per cent. of the leaves mature male or female inflorescences are developed, (6) while aborted inflorescence buds are sometimes found, on dissection, between the stem and the closely adpressed bases of the petioles of other leaves, and it is not unreasonable to assume that a potential inflorescence is formed in the axil of each leaf.

Inflorescences are developed excentrically in the axils of the leaves, lying either to the right or left according to the clockwise or anti-clockwise arrangement of the leaves, and protrude from the side of the base of the petiole.

Although oil palms are monoecious, they usually display mature inflorescences of only one sex at a time, and produce them in definite alternating phases which may be of equal or unequal lengths and numbers of inflorescences.

The alternating male and female phases are sometimes of about four months each, but they are not generally of this length nor of equal lengths for both sexes. Some palms produce inflorescences of one sex (rarely both) for periods of as long as twelve months or more. (11).

The lengths of these phases are usually fairly constant for individual palms but vary widely from palm to palm. Nevertheless, the total numbers of male and female inflorescences produced on an average stand of palms are approximately equal in an aggregate over sufficient length of time.

The proportions of male and female inflorescences per palm seem to be an expression of a definite genetical constitution, but the development and appearance of female inflorescences is probably governed to a considerable extent by the fertility of the soil and the amount of rainfall. (4).

At the time of change of phase, one or two inflorescences bearing both male and female spikes are sometimes found on a palm and it occasionally happens that the first inflorescences of a succeeding phase, though later in origin, may, by more rapid development, attain to maturity before the last inflorescences of the preceding phase. It also, apparently, happens that a series of inflorescences of one sex is followed by a single inflorescence of the other sex; then a single inflorescence of the first sex before; finally, it is followed by the series of inflorescences of the other sex.

It is very seldom, however, that a male inflorescence and female inflorescence are in flower together on the same palm.

The habit of overlapping appears, from present observations, to be typical of individual palms, but others have well defined male and female phases.

From the above observations, it will be realised that cross-pollination is the normal means of securing fertilisation, but that self-pollination, though probably very rare, is also possible. It is, at any rate, capable of producing viable seed, but whether it has an adverse effect on resulting progeny is as yet undetermined. Seedlings of controlled "selfings" are now being planted out for experimental purposes.

Floral Morphology.

As has been mentioned, the inflorescences are produced in the axils of the leaves, but their presence is not apparent until the apex of the inflorescence emerges above the base of the leaf petiole; at first the inflorescences are each enclosed in two spathes or sheathing bracts, the outer of which bursts about a month after it has fully emerged above the base of the petiole, while the inner sheath elongates with the inflorescence and splits, on an average, 16 days after the bursting of the first sheath, on a female inflorescence, and 20 days after, in the case of a male inflorescence.

From this point, the female infloresence usually takes longer than the male to reach maturity, but they both commence flowering in all at about 40 days from the bursting of the first sheath.

The Female Inflorescence.

The young female inflorescence continues to expand after splitting the inner sheath until it is a large oval "head" of about 12 inches long by 8 inches wide and 6 inches deep with between 100 and 200 spikes, bearing sessile female flowers and arising in spiral arrangement from a short central axis. The female flowers are fairly widely spaced along the spikes, the apices of which form large tough spines. Between 3,000 and 6,000 flowers are carried on the whole inflorescence.

The stalk of the inflorescence, arising in the axil of the leaf, is oval in section, being somewhat compressed between the base of the petiole and the stem of the palm, and is from 7 to 9 inches in girth. It is 10 to 12 inches long, but only about half of this is conspicuous above the base of the petiole. The female inflorescence is therefore not much elevated, and the fibrous remains of the inner sheath more or less encumber the base of the female inflorescence, thereby covering some of the lower-placed flowers and making them almost inaccessible to the wind-borne pollen.

An inflorescence protruding from one side or the other of the petiole of the subtending leaf, rests, when fully expanded, on the petiole of an older leaf in the next series. This petiole, later, provides necessary support for the bunch when weighted with fruits.

Each female flower is slightly sunk in the axis of the spike and is protected by a bract, the apex of which is sharp and thorn-like. These bracts are firmly

connected to the central axis and each is united with the adjoining bracts, so that a continuous shield is formed for the flowers on each spike.

The flower is about 14 mm. long by 8 mm. in diameter and consists of a large, syncarpous, tricarpellary ovary with a deeply divided trifid stigma on a very short style; a rudimentary staminal disc; three petals; three alternating sepals and two or three bracteoles. The petals, sepals and bracteoles are all sub-coriacious and scale-like and enlarge with the developing fruit. Very rarely flowers with four perfect carpels are found.

During development of the flower, two bracteoles usually each split off one wing which becomes separated from the main portion by a distance of about a third of the circumference of the flower base, and develops as a thin rod of tissue.

The three stigma lobes are thick and fleshy and white, about 6 mm. long when mature, and triangular in section, fitting closely together when immature. Each lobe has, along its inner angle, a very fine and fairly deep grove, on both sides of which are small glandular hairs; often one side, usually the left, is more hairy than the other. (8).

At maturity, and when the stigmas have pushed their way out of the enclosing perianth and are receptive, these lobes bend outwards, exposing the hairy inner angles for retention of pollen.

As the flowers become receptive, their temperature rises considerably and they give off a mild scent of aniseed, which seems to come most distinctly from between the bases of the lobes of the stigmas. At the same time, there is exudation of moisture along the grooved inner edge of each lobe. The secretion of moisture along the stigma lobes at receptivity is a not uncommon phenomenon in wind-pollinated flowers, and helps in the retention and rapid germination of the pollen grain.

The day after the flowers have fully matured, the tips of the stigma lobes turn pink and the colour spreads and deepens as the period of receptivity passes, until, soon after this is over, the whole stigma is deep purple in colour and is drying up.

The female inflorescence is in flower for four or five days with the majority of flowers opening on the first and second days, but the period of receptivity of individual flowers has been recorded as lasting for three days. (12).

The ovary of the female flower has, normally, three ovules of which, usually, one is fertilised and develops into a seed, while the other two atrophy. Occasionally, however, two, and more rarely three, seeds are formed.

After fertilisation of the ovum and the secondary nucleus in the embryo sac of the ovule, the normal cytological development takes place and the ovule eventually develops to form the egg-shaped seed, consisting of a comparatively thin seed coat and a solid kernel, which in turn comprises a viable embryo and a quantity of reserve food material or endosperm.

The stimulus following fertilisation is carried to the walls of the carpels and they develop to form a protective coat or pericarp, of which the inner portions or endocarp, becoming cemented with stone cells, form a very hard shell which surrounds the seed, while the outer layer or exocarp becomes succulent and oil-containing.

When two or three seeds are developed they remain entirely separated from each other, being individually surrounded by the hardened endocarp of their respective carpels.

In the apical portion of the shell there are three germination pores corresponding to the three carpels of the ovary, and directly above the embryos of the seeds within.

In the normal case, where only one seed is formed, two small flattened cavities can be found in the shell immediately below two of these germination pores, marking the relics of the two atrophied ovules.

The respective proportions of the whole ripe fruit are as follows:—

Exocarp or "pericarp" from 50 to 70 per cent.

Endocarp or shell from 20 to 40 per cent. and

seed or "kernel" from 3 to 13 per cent.

The shell of the "dura" form is from 2 mm. to 5 mm. thick. (3) (15).

A bunch of ripe fruit may weigh from a few lbs. up to 150 lbs. or so, according to the number of flowers successfully pollinated and to the fertility of the soil.

An average good bunch weighs from 30 to 40 lbs. and contains from 800 to 1,000 fruits in a large head armed with the more or less protuding spine-like apices of the numerous spikes.

When ripe, the fruits on the lower parts of the spikes, hidden inside the bunch, are bright orange in colour and are compressed into various angular shapes; the fruits on the outside, nearer the tops of the spikes, are larger and somewhat pear-like in form. These are generally 1½ to 2 inches in length and 1 to 1½ inches in diameter; full and round and of a dark brownish purple colour, with a bright orange and slightly angular compressed base.

The Male Inflorescence.

The male inflorescence, after bursting the inner sheath, grows further out and displays a panicle of finger-like spikes radiating from the central axis. On an average, there are about 100 fingers or spikes in each inflorescence. There are from 900 to 1,500 flowers on each spike, densely crowded, in a left to right spiral arrangement, forming a smooth, cylindrical or slightly club-shaped "finger" of about 6 to 8 inches long and ½ to ¾ of an inch in diameter.

The stalk of the male inflorescence is longer than that of the female, being from 15 to 18 inches in length, so that the mature male inflorescence is raised prominently above the base of the petiole and fairly well exposed.

The male flowers which are much smaller than the female, being about 4 mm. long by 2 mm. broad, have six stamens with large bilobed anthers dorsifixed on short filaments, which are united at the base to form a thick cup-like disc, surrounding a degenerate ovary with much reduced stigma. The stamens are enclosed by three scale-like petals and three almost similar sepals.

Each flower is sunk in the fleshy axis of the spike and protected by a bract which ends in a small hardened point. These bracts are united with the axis of the spike and with each other, forming a perforated sheath for the flowers, in like manner to that formed by the bracts on spikes of female inflorescences, but enveloping the flowers more completely.

The axes of the spikes of male inflorescences form at their apices tough, short spines, much less formidable than those of the spikes of female inflorescences.

When the flowers are mature, the staminal disc grows to form a tube, finally much more than half the height of the thus lengthened stamens, which emerge from the bractical envelope, bending outwards, so that the anthers eventually face upwards in star-shaped arrangement. The anthers open along the outwardly inclined inner edges of the lobes, and when fully open, expose a vast amount of pollen over the whole inflorescence.

The pollen is pale yellow in colour in bulk, is dry, and smells strongly of aniseed while fresh. The individual grains are tetrahedral in form with one face larger than the others, making a regular pyramid, the height of which is equal to, approximately, half the length of one of the sides of the triangular base, the sides of which are 35 μ in length. Very rarely pentahedral pollen grains are found, with a square base and four pyramidal sides.

Raphides of calcium oxalate in fairly large numbers are found amongst the pollen grains; they are probably a final product of metabolism accompanying the ripening of the anthers, and appear to be functionless.

Male inflorescences are in flower for about five days with most of the flowers opening on the second and third days.

It has been recorded in Sumatra that female flowers commence to open at about 4 a.m. No records of this nature have been made in this instance, but it has been noticed that flowers on male inflorescences often open between midnight and 2 a.m.

A few notes have been made on insect visitors but these will be included in a second article on means of pollination.

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CONDITIONS ON SMALL RUBBER HOLDINGS IN MALAYA.

3rd Quarter, 1934.

Prepared by the Economics Branch of the Department of Agriculture, Straits Settlements and Federated Malay States, in collaboration with the Field Branch of the Department.

Rainfall.

In the north of the Peninsula heavy rains were experienced throughout the quarter, flooding being general in all districts of Province Wellesley and Penang in September.

Rainfall was normal for the time of year in most other parts of the country. In North Johore dry weather continued throughout the quarter and in Negri Sembilan weather conditions were generally dry during July and August. Heavy rainfall was experienced throughout Malaya in September.

Prices.

There was a continued steady improvement in the prices paid for smallholders' rubber during the quarter under review, not so marked, however, in September when prices tended to remain at the August level.

Table I shews the lowest and highest prices at which rubber was purchased by dealers in each State. It will be noticed that although in a few cases there is a considerable difference between the extremes, the variation, on the whole, is within narrower limits than earlier in the year.

An additional table (II) is again given, shewing the mean of lowest and highest prices paid at a number of centres in each State during the quarter.

Sales of scrap rubber remained small, as noticed in the report of the second quarter, but in Kedah unfavourable climatic conditions led to larger quantities being sold in some places.

Tapping.

Tapping systems generally have taken a more conservative trend since the introduction of restriction; and in the case of Malay holdings in many areas, the preparation and planting of padi fields have prevented excessive tapping.

Owing to wet weather in Kedah, excessive tapping took place when days were fairly fine; some improvement in tapping methods was observed in South Kedah as a result of the work of the newly appointed Asiatic Rubber Instructor. In the Muar District of Johore it was reported that, since the advent of rubber regulation, several holdings of immature rubber had been brought into tapping earlier than advisable, the owners desiring to obtain a coupon allowance for such holdings.

Table I.

Lowest and Highest Rubber Prices Paid by Local Rubber Dealers.

(In Straits dollars per picul (133 1/3 lbs.))

3rd Quarter 1934.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
JULY								
Smoked sheet	24.50-29.00	24.00-29.00	25.50-30.30	24.00-30.00	23.00-30.00	26.00-30.00	25.00-29.00	24.00-30.00
Unsmoked sheet	21.50-28.00	22.00-27.00	12.00-27.00	22.00-28.00	19.00-28 20	24.00-28.00	20.00-27.80	20.00-29.00
Scrap	—	6.00-12.00	6.00-17.00	—	—	16.00-17.00	10.00-14.00	†1.50-11.00
AUGUST								
Smoked sheet	26.00-31.00	25.00-31.83	26.00-32.00	27.00-32.00	21.70-31.60	27.00-31.00	28.00-30.50	24.00-31.00
Unsmoked sheet	23.00-29.50	24.00-28.50	20.00-27.40	24.00-29.50	19.50-29.50	25.00-30.00	25.00-29.00	21.00-29.50
Scrap	—	8.00-15.00	13.00-20.00	—	—	15.00-17.00	12.00-15.00	†2.00-16.00
SEPTEMBER								
Smoked sheet	27.00-32.00	23.15-31.83	28.00-32.00	27.00-32.00	23.00-31.60	28.00-31.00	28.00-31.00	27.00-31.50
Unsmoked sheet	25.00-30.00	24.50-29.00	25.00-28.00	25.00-30.00	18.50-29.50	27.00-30.00	24.00-29.50	23.00-29.80
Scrap	4.00-16.00	9.00-15.50	14.00-18.00	12.00-17.00	11.50*	14.00-18.00	5.50-15.00	†2.00-17.50

*at one centre only.
†$1.50 and $2 at one centre only.

Table II.
Mean of Lowest and Highest Rubber Prices Paid by Local Dealers at a number of Centres in each State.
(In Straits dollars per picul (133 1/3 lbs.))

3rd Quarter 1934.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
JULY								
Smoked sheet	26.50-28.50	26.30-27.84	25.93-27.83	26.10-29.38	24.62-28.70	26.66-29.00	26.25-28.50	25.50-27.55
Unsmoked sheet	24.20-27.10	23.76-25.72	21.75-24.00	23.83-27.25	22.72-27.24	24.66-27.00	23.75-26.70	22.75-25.75
Scrap	—	6.00-12.00	10.00-12.50	—	—	16.00-17.00	11.00-13.00	5.75-6.50
AUGUST								
Smoked sheet	28.12-29.63	28.01-29.86	27.75-34.48	28.10-30.85	25.53-30.05	27.66-30.33	28.38-29.63	27.15-29.22
Unsmoked sheet	26.10-28.10	25.58-27.30	23.83-25.80	26.08-28.66	23.56-28.16	25.66-28.66	26.00-27.25	25.17-27.67
Scrap	—	8.00-15.00	13.50-18.00	—	—	15.00-17.00	13.25-14.25	10.43-12.53
SEPTEMBER								
Smoked sheet	28.25-30.25	28.54-30.60	28.58-30.67	28.50-31.50	26.13-30.58	28.66-30.33	29.38-30.75	28.32-29.02
Unsmoked sheet	26.60-28.70	26.42-28.00	25.75-27.70	26.33-29.16	23.60-28.76	27.00-29.33	26.63-28.50	25.57-28.04
Scrap	8.00-10.00	9.00-15.50	14.33-16.33	12.47-15.33	11.50*	15.33-16.66	11.00-12.86	10.94-13.12

*at one centre only.

Areas out of Tapping.

Estimates of areas untapped on small holdings were again obtained by counting the number of such areas and applying the percentage thus obtained to the total area of small holdings in the District.

Table III shews the results of the survey in September, and it will be seen that more areas have come into tapping again as conditions under rubber regulation became more stable.

The total of areas out of tapping on estates of less than 100 acres in the Federated Malay States, as at the end of September 1934, was estimated by the above system to be 42,600 acres as compared with 54,600 acres at the end of June. The total area untapped in the Straits Settlements at the end of the period under review was 13,900 acres as compared with 18,800 at the end of June. The relative figures for March, when rumours of restriction led to excessive tapping, were 34,950 acres and 9,900 acres in the Federated Malay States and Straits Settlements respectively.

Condition of Holdings.

Reports indicate that the very marked improvement in the condition of small holdings in all States has been maintained. In Krian 640 trees were lost in two areas during the storms and floods experienced in the first week of September. In the Kuala Langat District of Selangor, a number of Malay-owned smoke houses have been improved in order to better the quality of rubber produced. In the same District two new smoke houses of approved design have been constructed by Malays under the guidance of the Asiatic Rubber Instructor.

Diseases.

In Kedah, bark diseases again became very prevalent owing to the wet weather; disinfectants were extensively used for their treatment.

Mouldy rot remains the most prevalent disease in nearly all States, but it is generally kept well under control and wide use is made of approved fungicides available from the Department. In Johore an improvement is reported owing to weather conditions being unfavourable to the development of the disease. In the Krian and Selama Districts of Perak the heavy rains of August and September resulted in a marked recrudescence of the disease, further accentuated by the lack of attention given to holdings by their owners due to the incidence of padi planting operations.

A serious outbreak of pink disease was reported from Pahang and control treatment was being undertaken; a few cases were observed in Perak Central.

A sporadic outbreak of *Oidium Heveae* occurred in the Segamat District of Johore in July and was still in evidence during August and September when weather conditions were favourable to the spread of the disease. An outbreak of the disease was also reported in Selangor.

Cases of root diseases were rather frequent in Perak Central, but the damage occasioned was not extensive.

Table III.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres, at the end of September, 1934.

PERAK

District	Total Tappable area	Total area untapped	Percentage
Batang Padang	37,288	2,600	7
Kinta	34,180	1,400	4
Kuala Kangsar	43,485	1,600	7
Upper Perak	13,774	1,500	11
Larut & Selama	51,407	2,000	4
Krian	9,751	1,900	20
Lower Perak	47,937	3,400	7*
	237,822	14,400	6

SELANGOR

District	Total Tappable area	Total area untapped	Percentage
Klang	18,879	1,300	7
Kuala Langat	29,263	1,500	5
Ulu Langat	38,867	2,400†	6
Ulu Selangor	30,632	2,100	7
Kuala Lumpur	21,174	1,900†	6
Kuala Selangor	9,379		
	148,194	9,200	6

NEGRI SEMBILAN

District	Total Tappable area	Total area untapped	Percentage
Seremban	19,241	2,300	12
Tampin	17,947	2,200	12
Kuala Pilah	17,470	2,800	16
Jelebu	6,270	600	9
Port Dickson	10,653	500	5
	71,581	8,400	12

PAHANG

District	Total Tappable area	Total area untapped	Percentage
Raub	7,361	100	1
Kuala Lipis	15,951	2,200	14
Bentong	13,600	3,400	25
Other Districts	31,223	4,900	15
	68,135	10,600	15

MALACCA

District	Total Tappable area	Total area untapped	Percentage
Central	17,687	1,900	11
Alor Gajah	31,387	4,700	15
Jasin	24,971	1,500	6
	74,045	8,100	11

PENANG & P. WELLESLEY

District	Total Tappable area	Total area untapped	Percentage
North	3,241	400	11
Central	7,067	1,000	14
South	8,149	100	1
Dindings	7,279	2,800	39
Penang	11,114	1,100	10
	36,850	5,400	15

SINGAPORE

District	Total Tappable area	Total area untapped	Percentage
Singapore	12,781	400	3
	12,781	400	3

The percentage of areas out of tapping in June, 1934, was as follows:—Perak 10, Selangor 10, the Negri Sembilan 15, Pahang 14, Malacca 14, Penang and Province Wellesley 20, Singapore 8.

* Estimated from percentage for Kuala Kangsar.

† Estimated from percentage for other Districts in the State.

Grades of Rubber.

The variation in the grades of rubber purchased by dealers was again considerable and separate figures for the various States are given as a more exact guide to the position. The absence of scrap from such figures is particularly noticeable.

Kedah.—The percentage of smoked sheet increased during the quarter, the increase being considerable in certain Districts. Unsmoked sheet decreased in most Districts but increased in the Kulim District and the production of scrap was negligible throughout the State. Average percentages were :—Alor Star : smoked sheet 80, unsmoked 12, scrap 8; Kuala Muda : smoked sheet 48.5, unsmoked 44.5, scrap 7; South Kedah : smoked sheet 54, unsmoked 40, scrap 6; Baling : smoked sheet 82, unsmoked 16, scrap 2.

Johore.—In this State also the tendency was to an increase of smoked sheet, the percentages in Muar, Batu Pahat and Tangkak being respectively 67, 80 and 88. In Panchor, Senggarang, Kukup and Pontian, the reverse was the case, almost the entire purchases being of unsmoked sheet. The percentage of scrap sold was negligible with the exception of Batu Pahat, Johore Bahru and Kota Tinggi, 15 per cent., and Segamat, 10 per cent.

Perak.—In the District of Krian and Selama Sub-district the closed market for scrap resulted in an increased amount of sheet rubber being manufactured. The percentages were :—Krian : smoked 30, unsmoked 70; Selama : smoked 80, unsmoked 20.

In Perak North, smoked sheet increased to 77 per cent. in Taiping, but only in Trong was there any other considerable amount of this grade purchased (45 per cent.). In Perak South, with the exception of Tanjong Malim (smoked 100) Chenderian (smoked 52) and Slim Village (smoked 52) the average percentages of purchases at seven centres were : smoked 19, unsmoked 81.

In Perak Central the percentage purchases were : smoked sheet 60, unsmoked 33, scrap 7.

Selangor.—Percentage figures are not available but reports state that smoked sheet was generally made in the coastal districts and both smoked and unsmoked sheet in the inland districts.

Penang, Province Wellesley and Dindings.—In Penang, sales were entirely of unsmoked sheet; in Province Wellesley also, sales were principally of unsmoked sheet, though at three centres in the Central Circle sales were entirely of smoked sheet. In the Dindings percentage purchases were :—smoked sheet 53, unsmoked 44.5, scrap 2.5.

Malacca.—The percentages of purchases were as follows :—Central : smoked sheet 66, unsmoked 17, scrap 17; Alor Gajah : unsmoked 91, scrap 9; Jasin : smoked sheet 29, unsmoked 66, scrap 5.

Negri Sembilan.—Considerable variation in the percentage of grades sold is noticeable as in the foregoing States; sales of scrap are only taken into account in the Rembau District. In the Seremban District the average percent-

age of smoked sheet was 83; in the Kuala Pilah District, average percentages for five centres were: smoked sheet 42, unsmoked 58. In the Rembau District purchases were entirely of unsmoked sheet with the exception of an average of 7 per cent. of scrap. The average percentages for the Jelebu District were: smoked sheet 60, unsmoked 40; whereas in the Port Dickson District the percentages were exactly reversed.

General.

No cases of budding of rubber were reported during the quarter and new plantings were prohibited under the rubber regulations. A few areas in Kedah were replanted and it was reported that 530 acres in Negri Sembilan had newly been brought into tapping. There was no indication of any areas being abandoned in favour of other crops.

Reports from Pahang state that many Malays in the riverine mukims of Lipis now combine and send their rubber to the nearest big town in preference to selling at lower prices to the small local dealers.

The position of the small-holder has undoubtedly improved as a result of rubber regulation and the only cases of hardship now found are those where small holdings have been leased at low rates during the depression.

The result of the work of the newly appointed Asiatic Rubber Instructors is already to be seen in an improvement in the quality of rubber produced.

Abstract.

AGRICULTURAL DEVELOPMENT IN JOHORE.*

General.

In point of size, Johore is the third largest administrative unit in the Peninsula, being exceeded only by Pahang and Perak. The total area is stated to be 7,670 square miles, or 4,908,800 acres. Of this, it is roughly estimated that 1,160,000 acres are under cultivation.

The area in acres under different crops in the State at the end of 1932 was approximately as follows:—rubber 854,700, coconuts 165,100, pineapples 39,300, oil palms 27,800, rice 19,300, tapioca 17,300, arecanuts 10,000, mixed fruits 8,000, coffee 4,600, bananas 6,000, derris (tuba) 1,800, gambier 1,700, tobacco 1,400, sago 1,200, other minor crops 1,000.

Johore has thus the largest cultivated area of each of the major crops grown in any one administrative unit in the country except rice, *viz.*—rubber, coconuts, pineapples and oil palms, while there is no crop of any importance grown in Malaya which is not cultivated.

This outstanding position is of comparatively recent growth and has been achieved very largely during the post-war period 1919—1930. Actual figures for areas under cultivation in Johore during earlier years are difficult to obtain and unreliable; there is, however, no doubt that development has been phenomenally rapid, and there seem to be grounds for believing that the cultivated area has very nearly doubled during the past ten years.

Johore differs from other parts of the Malay Peninsula in that it contains no central mountain chain and consists mainly of level plains and gently undulating country. It is thus peculiarly favourably situated for development. The policy of opening up the country by means of roads and railway has facilitated development and in consequence, population and capital have flowed in at a rapid rate.

The census figures are illuminating in this connexion. According to the 1931 census, the total population of the State in that year was 505,000, while at present it is estimated to be 545,000; in 1921 it was 282,000 and in 1911 180,000, the percentage increases in the two decades being:—1911—1921, 56.4 per cent., 1921—1931, 79.0 per cent.

A considerable proportion of the increase is accounted for by immigration from countries outside Malaya, the census returns shewing that between 1921 and 1931 the nett immigration amounted to 125,000 persons, or roughly 25 per

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* Abstract of the Report on Agricultural Development in Johore by H. A. Tempany, C.B.E., D.SC., F.I.C., F.C.S., Director of Agriculture, Straits Settlements and Federated Malay States. Government Printing Office, Johore Bahru. 1934.

cent. of the total population, while 285,000 persons, or 56.6 per cent. of the population are foreign born. As the great bulk of the population is engaged in agriculture, its increase serves as an index of agricultural development. The total population comprises 234,000 Malaysians, 215,000 Chinese, 51,000 Indians, 700 Europeans, and 4,300 others.

Of the immigrant population, the Indians are mainly engaged as estate labourers; of the remainder, both Chinese and Malaysians are largely small-holders; they are industrious and thrifty and they are, for the most part, fairly skilled agriculturists; they are, in consequence, an addition to the population peculiarly favourable to development.

As elsewhere in Malaya, cultivation is divided between estates owned by Europeans and Asiatic capitalists, and small holdings.

Estate* agriculture is mainly confined to two crops, *viz.*—rubber and oil palms, but there must also be included about 11,000 acres of pineapples grown on estate or semi-estate lines as a main crop; uncertain areas of tapioca and gambier are being grown in the same way.

It is computed that about 510,000 acres represent what may be definitely termed estate cultivation, of which 469,000 acres are under rubber and 27,000 acres under oil palms.

The nationality of ownership of estates in Johore has been estimated to be as follows:—European 278,000 acres, Chinese 16,000 acres, Japanese 54,000 acres, Indian 14,000 acres, Malay 3,000 acres, other Asiatic races 1,000 acres.

It is noteworthy that in Johore, coconuts—which elsewhere in Malaya constitute a not unimportant estate crop—are grown exclusively in small holdings.

The area of small holdings in Johore is roughly 600,000 acres. It is clear, therefore, that the welfare of the small-holder must have a very particular significance for the Johore administration in as much as the prosperity of the State is so largely bound up therein.

Agricultural Policy in Johore.

Between the years 1921 and 1930, the tendency in Johore was towards rapid agricultural expansion; with the advent of the depression there has been a change. The cessation of alienation of land for rubber planting has been accompanied by an increasing determination on the part of the Government to ensure that the agricultural land of the State, which constitutes its chief natural asset, should not be wastefully exploited; at the same time, vigorous efforts are being made to achieve an accurate and complete system of land records and to correct any omissions and errors which may have occurred in the preceding period. Concurrently with these efforts, the extension and improvement of the agricultural services require attention.

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* An estate is defined as a planted area of not less than 100 acres.

The Agricultural Requirements of Johore.

In Johore, with its very large agricultural development and particularly its large peasant proprietary, there is obviously need for efficient agricultural services. Those responsible for the larger and more efficiently managed properties are in a position to make their wants known. In the case of the rubber industry these facilities already exist in the Rubber Research Institute, the officers of which are available for advice, visits and work on the spot whenever the need is indicated. In relation to other industries the position is somewhat different; the services of the research branch of the Department of Agriculture, S.S. and F.M.S., are to a certain extent available, but visits can ony be paid by specialist scientific officers at the request of the State Government and on payment of the full salary and allowances of any officer so sent.

With the development of the pineapple industry and possibly the tapioca, gambier, and tuba industries, into main-crop cultivations, the need for specialist advice is certain to become increasingly felt. Obviously, both planters and Government should have access to readily available and efficient advice and guidance and planters should be encouraged to utilise freely all assistance which can be rendered.

In relation to peasant industries the needs are more complex. The peasantry is usually not only unable effectively to express its needs, but also unable to realise fully what its needs really are; consequently, it cannot take steps to fulfil them, alone and unaided. Unless, therefore, Government is prepared to assist peasants by providing sound and practical advice and help, it is impossible to expect rapid development.

Necessary preliminaries to this form of assistance are a study of conditions and research work correlated to the requirements of the population. An example of this is to be found in the work carried out in the past four years in the Federated Malay States and Straits Settlements in relation to the improvement of copra. Other subjects which require consideration are concerned with the control of plant diseases, the marketing of peasant produce, and the provision for systematic training in agriculture for the younger generation of peasant cultivators.

The problems affecting particular agricultural industries in Johore are dealt with in some detail. The following account epitomises some of the more salient points.

The Rubber Industry.

The requirements of the estate section of the industry are more or less adequately catered for at present by the Rubber Research Institute of Malaya. The inauguration of a trained staff of Asiatic Rubber Instructors, which has now been approved, will enable small-holders to obtain more readily the advantages of the expert advice of the Institute. When this service has been organised, numerous problems will require to be considered and a definite programme of work will require to be drawn up. Amongst these will be attention

to disease and demonstration of the proper methods of dealing with it, attention to improvements in the preparation of smoked and unsmoked sheet, attention to tapping systems and possibly assistance in marketing the product.

Coconuts.

The very large area of coconuts contained in small holdings represents no less than one-fourth of the total area under this crop in Malaya.

The general lay-out of the area does credit to the skill and industry of the owners. The regular planting, admirable systems of drainage and general appearance of the plantations is superior to the majority of native holdings elsewhere in Malaya. One is struck by the freedom from disease, and concludes that the owners have been quick to see the advantage of such measures of control as are recommended by the Department of Agriculture, for by repressive measures alone such a result could hardly have been attained.

The copra is in the hands of Chinese and sometimes Javanese buyers. It is of poor quality and made on somewhat primitive kilns.

The situation calls for improvements in the methods of copra manufacture and organised selling. This will necessitate careful watching and supervision, and assistance will almost certainly be required in marketing, as without informed work in this direction also, experience has shewn that much of the profit that can be realised may be lost. Attention is directed to the copra work already achieved by the Department of Agriculture. The extension of this work to Johore is suggested.

Oil Palms.

Johore now possesses the largest area under this crop in any one State, *viz.* 30,000 acres. It is contained on six estates. The largest property has already 10,000 acres planted, and reserves of a further 15,000 acres. There are three factories at present working, and a fourth will shortly be erected. One of these factories is the largest and most up-to-date of its kind in Malaya, if not in the world.

The industry is a new one, and like all new industries, presents many problems requiring solution, comprising both problems of agriculture and problems of manufacture, the latter process being more than ordinarily complicated.

For the solution of these problems, readily available scientific advice and assistance are requisite, and it is essential in the interests of the industry and of the State that owners who have embarked much capital in these undertakings, should be able to call in such assistance whenever required.

It is clear that the very large amount of work which has been done on these problems by the Department of Agriculture has directly benefitted the industry, and there are good grounds for Johore supporting this scientific work and taking full advantage of the existing facilities.

Pineapples.

The pineapple industry is of peculiar interest to Johore at present, both on account of its extent and nature, and also in view of the fact that it is undergoing a transition from that of a catch crop grown between young rubber to that of a main crop.

The Malayan industry is the second largest in the world; it has an assured market, and the crop can be grown under as favourable conditions as anywhere in the world. Is is essential that the industry should be retained, but the present position is full of difficulty and danger. The industry is worked on the basis of supplying a demand for a cheap product. The period which has been put to its existence as a catch crop necessitates a sharp change in agricultural methods, and if it is to survive as a main crop, regular manuring and efficient cultivation must replace the formerly prevalent methods which were of little importance at a time when it was a question of planting as a catch crop between young rubber, but which can bring about the ruin of large tracts of land if the attempt is made to apply them to the cultivation of the fruit as a main crop.

Fortunately the needs of the situation have to an extent been foreseen and the establishment of the Pineapple Experiment Station in Singapore, to which Johore contributes one-third of the upkeep, has furnished the means of giving definite information as to the manurial requirements of the pineapple crop.

It is very desirable, by control of quality and regulation of supply, to endeavour to maintain a price which will allow a reasonable profit to producers. The legislation which has recently been passed in the Colony of the Straits Settlements and in Johore, should assist in this direction, while the work now being carried out in the Singapore Station on the experimental shipment of graded pines should also prove of value.

Concurrently, the improvement of working conditions and methods in factories and of market organisation needs attention.

The industry is handicapped by lack of attention to the quality of the produce, by destructive competition in selling, by old fashioned methods of manufacture, and in some cases, by unsatisfactory manufacturing conditions. It is, moreover, seriously threatened by the competition of other countries.

Factory conditions have much improved of late, but conditions under which the operations are conducted remain rather primitive, and the methods of canning and processing are still antiquated and out of date.

By systematic research, propaganda and organisation, the industry can be modernised and stabilised, but for this, considerable efforts and adequate resources are necessary.

Tapioca.

The position in relation to tapioca is not dissimilar to that of the pineapple industry. In Johore, tapioca has been extensively cultivated as a catch crop between young rubber, and an industry has grown up, the existence of which is threatened owing to the need for its conversion from a catch crop to a main crop basis.

Like many other products, Malayan tapioca does not attain the highest standard of quality and cannot compete in this respect with the Javanese product; it seems very probable that if the product could be brought up to the level of the Javanese, it could displace the latter in the markets of the United Kingdom.

In Malaya the crop is largely confined to Johore, which is by far the largest producer. If, as in the case of pineapples, it can be successfully converted from a catch crop to a main crop basis, a valuable industry will have been firmly established in the State; if not, a useful asset is likely to become lost.

The crop makes appreciable demands on the soil, but not more so than many others, and the problem of it continuous cultivation is, just as with pineapples, that of devising an economic system of manuring and cultivation which will enable it to be cultivated continuously, or in rotation with other crops on the same land.

Sago.

This product can conveniently be mentioned at this point and although it can hardly be dignified with the name "crop" it is a not unimportant item of export from Johore. Nothing has so far been done towards investigating the problem of its possible evolution into a regular crop.

Gambier.

Gambier is a third example of a crop which has been grown fairly extensively in Johore as a catch crop between young rubber, and which is now faced with the alternatives of either conversion to a main crop or abandonment as an industry.

Information on this crop is available, but should be supplemented with further work in Johore itself.

Tuba Root.

This is a crop which gives promise of capacity for not inconsiderable extension. It is cultivated in Johore entirely as a catch crop, but the possibilities of its development as a main crop should not be overlooked.

The product is used as an insecticide. Work on varieties and their inecticidal properties, on cultivation and manuring the crop are under investigation. As a guide to agricultural policy, this information should prove of value.

Fruit other than Pineapples.

It is estimated that there are approximately 17,000 acres of fruit other than pineapples under cultivation in Johore, of which approximately 8,000 acres are under bananas and 9,000 acres under other kinds.

The past and present work of the Department of Agriculture on fruits is recounted, and the importance of organising the marketing of fruit in Johore is stressed.

Coffee.

The area under coffee in Johore is the largest of any administrative unit in the Peninsula. Coffee is a crop which responds to cultivation and treatment; it is liable to certain diseases, and there are a considerable number of varieties with different yielding properties, different resistance to disease, different size of bean and different flavour.

Experiments on cultivation, disease, and preparation of coffee are in progress at Serdang, but it is desirable that this work should be supplemented by investigations in Johore where soil and climate factors are different from those at Serdang.

Other Minor Crops.

These include a number of products such as tobacco, patchouli and other essential oil bearing crops, pepper, sireh, ginger, chillies, kapok, groundnuts and vegetables.

On tobacco quite a considerable amount of work is being done by the S.S. and F.M.S. Department, but the position is complicated by fiscal questions. On the remainder, with the exception of patchouli, a certain small amount of research has been carried out and is in progress, but limitation of resources and a heavy programme of work in other directions at present limit its scope. If additional facilities for experimental work are provided in Johore, useful work thereon could no doubt be done.

Rice.

As elsewhere in Malaya, the question of rice-growing has lately been much discussed in Johore, while economic conditions have led to considerable extension of rice cultivation.

In 1930 the area under rice in Johore was 13,000 acres of which 6,210 acres were under wet padi; in 1932-33 it was 25,060 acres of which 15,800 acres were under wet padi.

The position in relation to rice-growing in Johore differs from that in most other States in that there is no history or tradition of padi planting. Consequently the backward condition of the padi industry is not surprising. In other parts of Malaya with a much longer history of development, padi-growing arose from the needs of the population to produce food.

It is admitted now that it is desirable that rice cultivation should be extended and the yields from existing areas improved. The opening up of entirely new areas should only be undertaken with circumspection, and when the assurance exists that the population required to take them up is available; in addition, adequate facilities must exist for other forms of cultivation to supplement the income of the rice grower.

It must further be realised that in Johore, the standard of rice cultivation is lower than elsewhere.

A considerable addition to the return of rice from existing areas in Johore can be made if cultivation practice can be improved. The Johore Government would be well advised to study carefully means of improving and extending cultivation in areas where it already exists, but should be chary of attempting tc open up large new areas immediately.

A decision as to the fitness of land for padi cultivation demands examination of topography and soil. Certain reconnaissances have already been made and a considerable number of soil samples examined and reported on for the Johore Government by the F.M.S. and S.S. Department of Agriculture. These reconnaissances should be continued as opportunity offers and the results kept for future guidance.

In view of the importance of irrigation, the assistance of the Irrigation Department would be of value to Johore.

So far as improvements in cultivation are concerned, these include better tillage, planting, and the use of improved strains of seed, but, to be able to advise on these subjects, experiments and demonstrations are necessary.

Test plots already laid down in Johore in conjunction with native cultivators have produced negative results.

It is suggested that the best plan is for Johore to follow the F.M.S. example and to establish a small number of test stations where accurate work may be performed and which will also serve as demonstration centres.

The suitability of padi varieties to particular environments is sometimes very restricted. This suitability can only be ascertained by experiment, and to be of value experiments must be conducted on standard lines in different districts.

In relation to research on rice the Department of Agriculture, S.S. and F.M.S., carries out a large programme of work affecting practically all aspects of the rice industry. As a result, many improved high-yielding varieties of rice have been evolved, tested out, and brought into general cultivation; manurial and cultural questions have been investigated as have also many pests and diseases.

Recommendations.

Johore is equally interested in the maintenance, development and well-being of industries other than rubber if not from the point of view of actual area cultivated, at least from the need for maintaining and expanding the many other kinds of agricultural activity that exist.

As a contribution to this, the existing provision of $3,000 per annum to the Department of Agriculture, Straits Settlements and Federated Malay States, is inadequate. The obvious solution lies in making provision commensurate with the value of the services rendered, on the undertaking that if such a contribution is made, the research service will be freely available and adequate staff and facilities will be maintained to meet fully the requirements of the State.

Reviews.

Coleopterous Pests of Stored Derris in Malaya.

By N. C. E. Miller, Special Bulletin, Scientific Series No. 14, Department of Agriculture, Straits Settlements and Federated Malay States. 1934. Price 50 cents (Straits Settlements).

Derris spp. or tuba root, is an insecticide which is commanding increasing attention in many parts of the world and especially in the United Kingdom and in America. Knowledge of its toxic properties and efficiency against various classes of insects is accumulating rapidly. Malaya and the Netherlands Indies are the countries of production of this product and on this, the producer's side, considerable investigation on methods of cultivation, valuable species, and preparation for market, has been carried out. One of the most serious obstacles against the wider use of derris in the past has been to find a convenient method of packing the raw product and the protection of the derris itself from the ravages of insect pests.

It may seem somewhat paradoxical that an insecticide should itself be subject to insect attacks.

The author gives a full account of the life histories of a number of coleopterous insects usually associated with such damage to derris, which is followed by recommendations which, if adopted, should obviate damage of this nature.

D. H. G.

Annual Reports of the Department of Agriculture, Straits Settlements and Federated Malay States.

In the compass of the Annual Report of the Director of Agriculture, little more is possible than an outline of the work of the Branches of the Department. The publication of the individual reports, therefore, has been found to be of value to investigators not only in this country but elsewhere, and such publications should be found useful for reference also by many non-officials in this country. Permanent records such as this offer an opportunity for the research worker in one country to study the methods adopted elsewhere and to seek therefrom a possible application to the immediate problems with which he is confronted.

Two recent Special Bulletins Nos. 19 and 20 of the General Series, of the Department of Agriculture, Straits Settlements and Federated Malay States, record the progress of work in that Department of the research, economic, and agricultural education branches, and of the various officers of the Field Branch, during the year 1933.

D. H. G.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports submitted by Field Officers.

The Weather.

In Kedah, the north western areas of Perak, Malacca and Singapore rainfall was above average; in other centres precipitation was below normal. Heavy rains towards the end of the month caused minor flooding in the low-lying areas along the banks of the Jelai and Lipis rivers in Pahang.

Remarks on Crops.

Rubber.—Compared with the previous month a general decline in price was reported from all centres.

Heavy rains reduced production by curtailing tapping operations. The weather was also responsible for a recrudescence of mouldy rot disease in all areas previously infectd. A satisfactory measure of voluntary control is reported, and the Department distribution of approved fungicides at low cost is meeting an increased volume of support.

The general improvement in small holding upkeep which has become apparent since the introduction of restriction has been generally maintained. Extravagant systems of excision continue to be reported from several centres.

Further improvement in small holding manufacture, as a result of instruction work carried out by the Small Holdings Advisory Service, is recorded.

Rice.—The price for padi at the Government Rice Mill, Bagan Serai, remained unchanged, but a slight decline occurred in Kedah towards the end of the month.

In Pahang South some early harvesting is in hand in the Temerloh District, while flowering has commenced in parts of the Dong, Penjom and Sega mukims, and in the coastal areas. A poor harvest is being reaped in the Batu Pahat District of Johore.

In Kedah and the large rice-producing District of Krian, planting has been completed, and where damage was sustained as a result of flooding in early September, the plants have made an excellent recovery. Water supplies are adequate and the crop presents an execellent appearance.

In other centres, with the exception of Kelantan and the southern areas of Province Wellesley, planting is completed and favourable crop progress reported.

Coconuts and Copra.—There was a slight appreciation during the month of the Penang price for f.m.s. quality copra, the range being $3.07 to $3.15 per picul.

Following the padi-planting break, small holding production in the Krian District recommenced. Some sixty-four piculs shipped to Penang from one improved kiln realised $3.10 per picul.

Keen competition among dealers in several important producing centres has resulted in a marked rise in nut prices, the highest recorded being $14 per thousand. At this price copra production is not economic.

Improved small holding kilns continue to produce good quality copra in the Muar District of Johore. Further kilns of a good type will shortly be in production on the western coast of that State.

Fruit.—In the Jelebu District of Negri Sembilan, where a considerable export of bananas is made to markets in Singapore, Malacca, Kuala Lumpur and Seremban, durians, mangosteens, rambutans, langsats and mata kuching are being harvested. A heavy crop of durians is reported from the Ulu Lipis valley of Pahang, while machang, mempelam, chiku, mangosteen, durian, pulasan and rambutan are fruiting in the Klang District of Selangor.

Pineapples.—Harvesting commenced in the Kulai and Kota Tinggi areas in Johore, but supplies were not sufficient for factory requirements; one plant only was in use and it was operating on part-time.

Fruiting commenced in many centres in Singapore, and factory prices declined in view of forthcoming supplies. The season has also opened in the Klang and Kuala Langat Districts of Selangor, the local factory taking a portion of the crop, the balance being exported to Singapore.

Tuba.—A brisk demand exists in Singapore for good quality dried root; numerous enquiries have been made for information and planting material.

Tapioca.—Interest in this crop has been maintained in Kedah where a further area of 390 acres has been planted.

Carp Rearing.

This industry is making appreciable progress among Malays in Pahang. Recently imported fry are making very satisfactory progress at Chat, and the stock at Benta have now reached an average weight of 2½ kati each. Further ponds are in the course of construction in the mukim of Semantan.

Poultry.

Outbreaks of disease, which have so far not being diagnosed, occurred at Sitiawan in Lower Perak; Cheras and Kerling in Selangor; Ketapang near Pekan, Pahang; and in the Kukub District of Johore. Roup was present on the Sungei Udang Experiment Station, Malacca. In no case was a heavy mortality experienced.

Kampong and Home Garden Competition.

Preliminary judging has commenced in Pahang, where many gardens are reported to be of a very high standard of excellence. Enthusiasm in connexion

with these competitions has not been maintained in the Klang District of Selangor where entries are twenty-seven as compared with ninety-five for last year.

Agricultural Stations.

Good progress continues to be made on all Stations. Permanent crops such as tea, coffee and fruit are becoming established, and appreciable quantities of planting material of minor crops and food stuffs have been raised to meet an increasing demand. Considerable attention has recently been given to poultry and most Stations are now supporting flocks of pure-bred birds. Native agriculturists are evincing much interest in these demonstration centres and are increasingly appreciating the services they are intended to supply.

Padi Stations and Test Plots.

With the exception of Sungei Tontong in the Dindings, planting is now complete. Flowering has commenced at Dong and Lipis Plots in Pahang, and Jelebu in Negri Sembilan. Heavy winds have caused some lodging in Plots situated in the coastal areas of Pahang.

Two early Hongkong varieties of rice proved quite unsuitable for local conditions in Kedah. They produced grass-like foliage and very small ears; they were eventually discarded and replaced by the variety Mayang Sebatil. Hongkong varieties are also in flower at Pulau Gadong Experiment Station, Malacca, but are not comparable even with the poorest local types.

At Titi Serong the crop made a good recovery from the flood damage experienced early in September. Weeding is now in hand, pest damage is negligible, and the crop presents an attractive appearance.

Heavy rains at the beginning of the month caused much damage by flooding on the newly transplanted area recently opened up for mechanical cultivation at Pulau Gadong.

Reports on conditions generally from all experimental centres are satisfactory, and prospects for at least an average harvest are good.

DEPARTMENTAL NOTES.

Rural Broadcasting

The scheme formulated by the Propaganda and Marketing Committee for the introduction of broadcasting in the Malay language to village communities is under consideration by a sub-committee appointed by that body.

With the assistance of officers of the Posts and Telegraphs Department, tests of reception have been carried out at various centres in Selangor. The results were reasonably satisfactory in most instances.

The next step is to test suitable apparatus by means of a short programme at a particular centre, the object being not only to ascertain the suitability of the receiving set, but also the number of people who can hear at one time, as well as to select announcers.

It is hoped, if this short trial is satisfactory, to introduce an experimental weekly broadcast programme of varied items over a period of two months, commencing before the end of the present year.

The Propaganda and Marketing Committee, who have this matter in hand, is composed of officers of the Co-operative, Agriculture and Veterinary Departments and of the Rubber Research Institute.

Meeting of the Agricultural Advisory Committee.

A meeting of the Agricultural Advisory Committee was held at the Department of Agriculture, Kuala Lumpur, on 18th October 1934, when the progress of the work of the Department for the past few months was reviewed and several important questions of policy discussed.

Tours of the Director of Agriculture.

The Acting Director of Agriculture and the Acting Chief Field Officer visited Sabak Bernam and the new padi area of Panchang Bedina in that sub-District on October 13th, 14th and 15th. The improved copra kiln owned and operated by a group of Malays at Sabak Bernam was inspected and matters relating to the purchase of nuts and sale of copra were discussed.

The Panchang Bedina and Haji Durani Padi Test Stations were inspected. Notes were made on the present conditions of the new padi area and on various points in connexion with future requirements.

The Acting Director of Agriculture paid a visit of inspection on October 15th to the Dong and Kuala Lipis Padi Test Station in Pahang and to the Agricultural Station, Kuala Lipis.

Visit to Labuan and Brunei.

In accordance with arrangements at present in force for the establishment of agricultural services in Labuan and Brunei, the Agricultural Field Officer, Singapore, paid a visit to these territories between 22nd September and 23rd October, 1934.

Leave.

Mr. J. Lambourne, Assistant Agriculturist, has been granted 9 month full-pay leave from 12th October 1934 to 11th July 1935 inclusive.

Mr. T. D. Marsh, Assistant Agriculturist, returned from leave on 25th October, 1934.

DISTRICT AGRICULTURAL SHOW.

Mersing (Johore) Agricultural and Industry Exhibition.

A two-day Agricultural and Industry Exhibition was held at Mersing, Johore, on 27th and 28th September 1934. In opening the Exhibition, the Dato Mentri Besar, Johore, stressed the importance of agriculture and village industries to small-holders in that part of the State.

Sections were provided for cereals, vegetables, fruits and village industries. The exhibits in the agricultural sections were not numerous, due in the case of cereals and fruits, to the unsuitability of the dates for holding the Show. The Show was originally fixed for June, but was postponed owing to unforseen circumstances.

The Department of Agriculture staged an exhibit, and in the evenings delivered lantern lectures on agricultural subjects of particular interest to the cultivators in this District.

Statistical.

MARKET PRICES.

October 1934

Rubber.—The price of rubber continued to weaken during October and, opening at 24¼ cents per lb. for spot loose in Singapore, the market closed at 21⅞ cents per lb. The average price for the month in Singapore was 22.76 cents per lb. for Smoked Sheet equal to London Standard, as compared with 25.09 in September. The average price for October in London was 6.75 pence per lb. and in New York 13.78 cents gold per lb. as compared with 7.41 pence and 15.26 cents gold respectively in September.

Weekly prices paid during October for small-holders' rubber at three centres are shewn in the following table.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, October, 1934.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.				Kuala Kangsar, Perak.				Batu Pahat, Johore.			
	4	11	18	25	3	17	24	31	3	17	24	31
Smoked sheet			26.50			26.79	26.09	25.00	26.38		24.70	24.22
Unsmoked sheet	23.21	24.07	24.06	24.09	24.74	23.15	21.99	22.00		23.05	23.28	22.32
Scrap	13.68			14.00		15.00					15.53	

Transport by lorry Kuala Pilah to Seremban 15 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

No purchases at Batu Pahat and Kuala Kangsar on 10th October.

Palm Oil.—The following prices for the local commodity, c.i.f. landed weight, Liverpool, are now available:

13th September,	1934	£12. 0. 0
20th "	"	12.10. 0
27th "	"	13. 0. 0
4th October,	"	13. 0. 0
11th "	"	13. 0. 0
18th "	"	13. 0. 0
26th "	"	13. 0. 0

Palm Kernels were quoted on the 26th October at £6.17.6 per ton c.i.f. Continent.

Copra.—The feature of the Singapore market was the improvement in the price of the mixed quality which rose from an opening price of $2.35 per picul to $2.70, and closed at $2.60. The sun-dried grade opened at $2.95 per picul, rose to $3.20 and closed at $2.90, averaging $3.01 as compared with $2.93 in September. The average price for the mixed quality was $2.52 as against $2.28 in September.

Copra cake weakened slightly, averaging $1.65 per picul as compared with $1.77 in September.

Rice.—The average wholesale prices of rice per picul in Singapore during October were as follows:—Siam No. 2 (ordinary) $3.39, Rangoon No. 1 $3.30, Saigon No. 1 (long grain) $3.30, as compared with $3.13, $3.16 and $3.17 in August. Corresponding prices in September, 1933 were $3.53, $2.88 and $3.22 respectively.

The average retail market prices in cents per gantang of No. 2 Siam rice in September were: Singapore 26, Penang 25, Malacca 26, as compared with 23, 24 and 23 respectively in August.

The average declared trade value of imports of rice in September was $3.38 per picul as compared with $3.03 in August and $2.85 in July.

Padi.—The price paid for padi at the Government Rice Mill, Bagan Serai, continued at $1.50 per picul; a privately owned mill paid $1.40 per picul. Prices per gantang ranged from 5 to 13 cents in various parts of the country.

Tea.—Tanah Rata (Cameron Highlands) tea was quoted in London during September at 11d. per lb. and Bigia (Kedah) tea was quoted at an average of 10.75d. per lb.

Average London prices per lb. for tea consignments from other countries were as follows:—Ceylon 1s.0.32d., Java 9.44d., Indian Northern 1s.0.85d., Indian Southern 11.05d., Sumatra 9.03d. The decline in prices continued during the month until the last week when a slight improvement was evident.

Tuba Root (Derris).—Transactions in this commodity during October were on a limited scale. The Singapore average price for roots sold on rotenone content continued unchanged at $40 per picul, but the market for roots sold on a basis of ether extract weakened still further, the average price for the month being $28 per picul as compared with $30 in September.

Coffee.—Prices in Singapore of coffee weakened during October. Sourabaya coffee opened at $19 to $20 per picul falling to $18 to $19 at the close; Palembang coffee opened at $13 per picul and fell to $12, an average for the month of $12.44 as compared with $13.19 in September.

Local prices for coffee beans ranged from $14 to $32 per picul.

Arecanuts.—October average prices per picul in Singapore were as follows:—Splits $5.31 to $6.06, Sliced $10 to $12.44, Red Whole $5.69 to $6.25, Kelantan $5.69 to $5.94, the price in each range depending upon quality. No prices were quoted for Bila Whole and Sourabaya Whole.

The average prices per picul quoted by the Singapore Chamber of Commerce were:—Best $5.48, Medium $5.05, Mixed $4.70.

Gambier.—Singapore prices continued their upward trend during October and closed at $6.75 per picul for Block, and $9.50 per picul for No. 1 Cube. The respective average prices for the month were $5.81 and $8.94 as compared with $4.40 and $7.70 in September.

Pineapples.—The Singapore market remained at a standstill, prices being nominal with no contracts passing. Prices quoted per case were:—Cubes $3.05, Sliced Flat $3, Sliced Tall $3.25. The average prices for September were $3.11, $3.05 and $3.25 respectively.

In Johore, prices for fresh fruit were: No. 1 quality $2 to $2.40 per 100, No. 2 quality $1.80 to $2 per 100, No. 3 quality $1.20 to $1.60 per 100. Prices in Singapore at factories were $2.20 per 100 for large fruit and $1.60 per 100 for small fruit. Prices in Selangor ranged from 50 cents to $3 per 100 according to quality and $3 to $10 per 100 for Sarawak pines.

Tapioca.—The Singapore market remained unchanged during October with the exception of Flake Fair which weakened to $3.40 in the second half of the month.

Average prices per picul were:—Flake Fair $3.45, Seed Pearl $5.50, Pearl Medium $5.85, as compared with $3.65, $5.70 and $5.85 respectively in September.

Sago.—Singapore prices of Pearl, Small Fair, remained unchanged at $3.90 per picul throughout the month, but Flour, Sarawak Fair, improved with increased demand averaging $2.03 per picul. The September average prices were $3.94 and $1.92½ respectively.

Mace.—Although very little business was passing Singapore prices remained high and unchanged throughout the month owing to stocks being light. Prices were: Siouw $90, Amboina $60 per picul as compared with average prices of $90 and $57 respectively in September.

Nutmegs.—There was good enquiry for nutmegs during October and prices improved accordingly. Average prices were $25 per picul for 110's and $26 per picul for 80's an increase of $1 per picul in each case as compared with September.

Pepper.—The market was again considerably affected by speculative buying in London which forced up prices, Singapore White closing at $61 per picul and Muntok White $63 per picul. Average prices per picul in Singapore for the month were:—Singapore Black $18.88, Singapore White $55.50, Muntok White $57.38, as compared with $15.50, $40.30 and $41.70 respectively.

Cloves.—Singapore prices continued nominal at Zanzibar $35 and Amboina $45 per picul.

Tobacco.—Prices of sun-dried leaves ranged from $6 to 48 per picul according to quality. Java tobacco was quoted in Perak at $60 to $70 per picul and in Johore at $40 to 80 per picul.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Mackay & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY.*

September 1934.

Malaya.—Imports of foreign rice into Malaya during September were 67,441 tons and exports 17,096 tons, net imports accordingly being 50,345 tons. For the period January to September, 1934, net imports were 352,586 tons, an increase of 11.6 per cent.†

Of the imports during September, 50 per cent. were consigned to Singapore, 15 per cent. to Penang, 6 per cent. to Malacca, 20 per cent. to the Federated Malay States and 9 per cent. to the Unfederated Malay States. Of the total, 69 per cent. came from Siam, 28 per cent. from Burma, 2 per cent. from French Indo-China and 1 per cent. from other countries.

Of the exports during the month under review, 67 per cent. were shipped to the Netherland Indies and 33 per cent. to other countries. The various kinds of rice exported were: Siam 11,081 tons (64.8 per cent.), Burma 3,760 tons (22 per cent.), French Indo-China 354 tons (2 per cent.), India 1,789 tons (10.5 per cent.), local production 112 tons (0.7 per cent.).

India and Burma.—Foreign exports for the period January to August, 1934, totalled 1,121,000 tons, as compared with 1,465,000 tons in 1933, a decrease of 23.5 per cent.

Total exports of rice and bran from Burma for the period 1st January to 1st September, 1934, amounted to 3,085,275 metric tons as compared with 2,591,490 metric tons in 1933, an increase of 19 per cent.

According to the *Indian Trade Journal,* 4th October, 1934, the exportable surplus from Burma from the new crop was estimated at 3,200,000 tons (all kinds of rice and rice products), a decrease of 250,000 tons or 7.2 per cent. as compared with the forecast of the previous year.

The first forecast of the crop in Burma for the season 1934-35, states that the area likely to mature is estimated at 12,496,700 acres, a decrease of 78,600 acres or 0.6 per cent. as compared with the corresponding estimate for the season 1933-34, and an increase of 32,400 acres or 0.3 per cent. as compared with the final figures for that season. A good harvest is indicated for the Province as a whole if the October rains prove favourable.

Siam.—August exports of rice from Bangkok were 191,246 tons, giving a total of 1,198,810 tons for the period January to August as compared with 1,104,135 tons in 1933.

Japan.—The 1934 rice crop of Japan Proper has been estimated at 7,998,146 tons, which is 19.5 per cent. less than the actual crop of 1933 and 8.9 per cent. less than the average of the previous five years.

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* Abridged from the Rice Summary for September, 1934, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1933.

The area under rice in Formosa for the first crop of 1934 was 712,605 acres, an increase of 5,034 acres or 0.7 per cent. as compared with the corresponding crop of 1933. Production amounted to 632,658 tons, which is 80,265 tons or 14.5 per cent. more than was harvested during the same season in 1933.

French Indo-China.—Entries of padi into Cholon, 1st January to 30th September, 1934, totalled 1,246,700 metric tons, an increase of 37 per cent. as compared with 910,007 metric tons in 1933.

Exports of rice for the same period this year were 1,141,821 metric tons, an increase of 10.3 per cent. as compared with 1,035,464 metric tons in 1933.

The report on the Saigon Rice Market for September 1934 indicates that there was an almost entire lack of enquires from abroad and prices accordingly weakened, the market closing on a falling tendency.

Netherlands Indies.—Imports of rice for the period January to July, 1934, (*Economic Bulletin* 1st October, 1934) totalled 107,404 metric tons, a decrease of 57.9 per cent. as compared with imports of 255,734 metric tons in 1933.

The area under rice in Java and Madura harvested during this period was 7,595,250 acres, as compared with 7,713,810 acres in 1933, a decrease of 1.5 per cent.

Ceylon.—For the period January to September, 1934, imports totalled 359,577 tons, an increase of 10.9 per cent. as compared with 324,331 tons in 1933. Of the 1934 imports 14.5 per cent. were from British India, 62.9 per cent. from Burma and 22.6 per cent. from other countries.

Europe and America.—Shipments to Europe from the East were 950,032 tons for the period 1st January to 20th September 1934, as compared with 1,028,482 tons in 1933, a decrease of 7.6 per cent.

Of the 1934 shipments, 39 per cent. were from Burma, 5 per cent. from Japan, 45 per cent. from Saigon, 9 per cent. from Siam and 2 per cent. from Bengal. The corresponding percentages for 1933 were 51, 2, 39, 7 and 1 respectively.

Shipments to the Levant from the East for the period 1st January to 11th August, 1934, were 22,899 tons, an increase of 8.6 per cent. as compared with 21,087 tons in 1933.

Shipments to the West Indies and America for the period 1st January to 22nd August, 1934, were 138,626 tons, an increase of 15.8 per cent. as compared with 119,703 tons in 1933.

MALAYAN AGRICULTURAL EXPORTS, SEPTEMBER, 1934.

PRODUCT.	Net Export in Tons.				
	Year 1933.	Jan.-Sept. 1933.	Jan.-Sept. 1934.	September 1933.	September 1934.
Arecanuts ...	20,756	14,930	14,569	1,417	1,056
Coconuts, fresh ...	100,609†	78,454	72.366	10,388	7,270
Coconut oil ...	17,568	13,048	18,348	1,289	2,081
Copra ...	110,543	73,037	66,676	12,492	6,151
Gambier, all kinds ...	2,560	1,802	1,598	165	151
Oil cakes ...	9,992	7,616	8,255	778	945
Palm kernels ...	1,983	1,433	2,077	285	191
Palm oil ...	12,101	7,118	10,239	988	1,515
Pineapples canned ...	59,582	49,718	56,837	2,873	2,973
Rubber ...	459,836¶	331,796¶	351,881¶	39,897¶	42,097¶
Sago,—flour ...	7,648	2,605	5,560	245*	814
„ —pearl ...	2,646	1,644	3,551	214	436
„ —raw ...	4,420*	3,070*	4,736*	421*	615*
Tapioca,—flake ...	9,881	7,950	4,939	711	323
„ —flour ...	702*	195*	1,476*	69*	160*
„ —pearl ...	17,297	12,932	12,077	1,324	1,349
Tuba root ...	569½	343½	422	30	40½

† hundreds in number. * net imports. ¶ production.

MALAYAN PRODUCTION IN TONS OF PALM OIL AND KERNELS 3rd QUARTER, 1934.

(As declared by Estates)

	Palm Oil		Palm Kernels	
	F. M. S.	Johore	F. M. S.	Johore
July	1,111.4	586	162.1	118.0
August	1,486.7	479	211.1	75.5
September	1,467.6	411	206.2	61.3
Total	4,065.7	1,476	579.4	258.4

MALAYA RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 30TH SEPTEMBER, 1934.

State or Territory	Acreage of Tappable Rubber end 1933 (d)	Estates which have entirely ceased tapping		Estates which have partly ceased tapping (a)		Area of Tappable Rubber never been tapped		Total (3) + (5)	Percentage of (9) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STRAITS SETTLEMENTS :—									
Province Wellesley	44,285	1,129	2.5	8,576	19.4	570	1.3	9,705	21.9
Dindings	7,368	112	1.5	844	11.5	195	2.6	956	13.0
Malacca	121,152	584	0.5	16,785	13.8	3,123	2.6	17,369	14.3
Penang Island	1,366	185	13.5	424	31.0	201	14.7	609	44.5
Singapore Island	28,842	3,910	13.5	4,319	15.0	523	1.8	8,229	28.5
Total S.S. ...	203,013	5,920	2.9	30,948	15.2	4,612	2.3	36,868	18.1
FEDERATED MALAY STATES :—									
Perak	253,227	3,667	1.4	37,101	14.7	13,989	5.5	40,768	16.1
Selangor	310,003	4,291	1.4	43,342	14.0	12,369	4.0	47,633	15.4
Negri Sembilan	233,592	4,979	2.1	34,466	14.8	18,468	7.9	39,445	16.9
Pahang	46,712	4,449	9.5	13,966	29.9	9,400	20.1	18,415	39.4
Total F.M.S. ...	843,534	17,386	2.0	128,875	15.3	54,226	6.4	146,261	17.3
UNFEDERATED MALAY STATES :—									
Johore	365,400	10,324	2.8	25,743	7.1	22,179	6.1	39,067	9.9
Kedah (b)	126,588	1,632	1.3	28,816	22.8	19,550	15.4	30,448	24.1
Kelantan	25,793	8,471	32.8	129	0.5	5,418	21.0	8,600	33.3
Trengganu (b)	4,543	Nil	Nil	98	2.2	98	2.2	98	2.2
Perlis (c)	1,181	Nil	Nil	266	22.5	266	22.5	266	22.5
Total U.M.S. ...	523,505	20,427	3.9	55,052	10.5	47,511	9.1	75,479	14.4
TOTAL MALAYA ...	1,570,052	43,733	2.8	214,875	13.7	106,349	6.8	258,608	16.5

Notes :—(*a*) Area out of tapping on Estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.
(*b*) Registered Companies only.
(*c*) Rendered quarterly.
(*d*) Figures are as reported by estate managers.

MALAYA RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF SEPTEMBER, 1934, IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
								during the month		January to Sept. inclusive 1934		during the month		January to Sept. inclusive 1934				
	Ports	Dealer	Estates of 100 acres and over	during the month	January to Sept. inclusive 1934	during the month	January to Sept. inclusive 1934	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States ...	...	11,576	9,137	12,530	106,054	9,343	79,861	Nil	Nil	Nil	Nil	16,540	3,299	134,951	61,781	...	13,189	9,546
Johore ...	...	2,518	2,509	3,977	33,530	5,435	40,633	Nil	2	Nil	272	1,744	6,820	14,742	60,303	...	3,081	2,796
Kedah ...	...	393	1,927	2,495	24,365	1,762	13,720	Nil	Nil	Nil	Nil	1,522	2,370	13,290	24,942	...	684	2,001
Perlis ...	...	32	12	8	119	8	277	Nil	Nil	Nil	Nil	Nil	19	Nil	398	...	23	18
Kelantan ...	...	231	246	379	2,257	625	6,141	Nil	Nil	319	Nil	71	918	803	7,840	...	211	281
Trengganu ...	...	55	50	291	2,064	145	1,029	Nil	Nil	Nil	Nil	Nil	436	Nil	3,093	...	55	50
Total Malay States	...	14,805	13,881	19,680	168,389	17,318	141.661	Nil	2	319	272	19,877	13,862	163.786	158,317	...	17,243	14,692
STRAITS SETTLEMENTS :-																		
Malacca ...	...	2,905	921	1,574	12,440	1,903		Nil		4		2,718		29,114		...	3,162	976
Province Wellesley	...	1,849	491	526	5,131	291		Nil		Nil						...	1,504	443
Dindings ...	...	40	139	107	974	120		Nil		Nil						...	82	144
Penang ...	3,394	14,412	12	9	109	120	21.525	2,192	14.557	21.817	147.767	9,578	Nil	74.507	Nil	2,695	12,735	9
Singapore ...	9,640	44,815	258	209	1,652	240		15,866		155.303		28,878		252,19		7,431	42,170	174
Total Straits Settlements	13,034	64,021	1,821	2,425	20,306	2,674	21,525	18,058	14,557	177.124	147.767	41,174	Nil	355.815	Nil	10,126	59,653	1,746
TOTAL MALAYA	13,034	78,826	15,702	22,105	188 695	19,992	163.186	18,058	14,559	177,443	148.030	61,051	13,862	519,601	158,357	10,126	76,896	16,438

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
20	21	22	23	24	25	26
DRY RUBBER	11,569	35.804	9.729	4.335	1.918	338
WET RUBBER	1.620	6.366	3.006	413	1.163	346
TOTAL ...	13.189	42,170	12,735	4,748	3,081	684

TABLE III
FOREIGN EXPORTS

PORTS	For month	January to Sept. 1934
Singapore ...	39,029	348.147
Penang ...	14.564	114,623
F t Swettenham.	6,895	51,484
Malacca ...	563	5.347
MALAYA ...	61.051	519,601

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January to Sept. 1934
Malay States ...	33.737	315.373
Straits Settlements	4.105	
MALAYA ...	37,842	315.373

Notes :—
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained
2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. *i.e.*, Column [9] = Columns [15] + [16] + [19] + [20] + [21] + [22] −[4]−[5]−[6]−[7]−[11]−[12]. For the Straits Settlements. Column [9]: figures for Singapore and Penang Islands represent sales or exports as shown by cess paid and for the mainland represent as previously purchases by dealers from local estates of less than 100 acres, reduced by 15 % to terms of dry rubber.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet. 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Domestic exports are reported by the Customs Authorities for the Malay States and by the Registrars of Imports and Exports for Province Wellesley, Malacca, Dindings Labuan and Brunei. For Singapore and Penang Island domestic exports are represented by sales or exports of rubber as shown by cess paid.
5. The above, with certain omissions, is the Report published by the Registrar.

METEOROLOGICAL SUMMARY, MALAYA, SEPTEMBER, 1934.

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	Means of B. Min.	Mean of A and B.	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total in.	Total mm.	Most in a day. Amt. in.	Number of days: Precipitation .01 in or more	Precipitation .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.								
Railway Hill, Kuala Lumpur, Selangor ...	90.0	71.4	80.7	94	69	83	74	83.7	84.4	7.12	180.9	3.22	18	12	3	1	1	144.75	4.83	40
Bukit Jeram, Selangor ...	87.7	72.2	79.9	91	69	83	75	82.7	84.4	5.47	138.9	2.10	15	10	3	1	2	154.35	5.15	43
Sitiawan, Perak ...	88.3	72.1	80.2	92	71	79	74	83.0	84.7	7.91	200.9	2.93	14	12	1			135.15	4.57	37
Temerloh, Pahang ...	89.7	72.4	81.1	92	70	84	74	84.7	85.9	6.21	157.7	2.56	15	13	1	12		166.45	5.55	46
Kuala Lipis, Pahang ...	88.0	71.2	79.6	90	69	83	74	83.4	84.4	4.54	115.3	1.03	14	11	1	25		144.10	4.80	40
Kuala Pahang, Pahang ...	87.1	73.5	80.3	90	72	84	76	85.1	86.2	7.87	199.9	1.50	21	19	5		2	217.45	7.25	60
Kallang Aerodrome, S'pore ...	86.6	76.3	81.5	90	72	82	79	81.9	82.9	4.57	116.1	1.39	9	7	2	3		177.05	5.90	49
Butterworth, Province Wellesley ...	85.9	73.9	79.9	89	71	76	76	82.1	84.1	21.73	551.9	6.77	18	14	2		1	136.80	4.56	38
Bukit China, Malacca ...	84.7	73.6	79.1	87	71	82	76	83.1	83.7	6.67	169.4	1.47	18	15				157.85	5.26	43
Kluang, Johore ...	88.1	70.8	79.5	91	67	82	73	81.5	81.9	2.07	52.6	0.61	11	9		8		150.95	5.03	42
Bukit Lalang, Mersing, Johore	87.3	71.7	79.5	90	68	81	75	80.8	81.3	6.92	175.8	1.06	22	19	3	4		177.35	5.91	49
Alor Star, Kedah ...	86.4	74.1	80.3	89	71	77	76	85.2	85.3	12.20	309.9	1.60	17	17	3		1	163.35	5.45	45
Kota Bahru, Kelantan ...	88.9	73.4	81.1	92	71	85	76	84.7	85.0	8.12	206.3	2.49	17	14	7			171.40	5.71	46
Kuala Trengganu, Trengganu	88.5	72.7	80.6	91	71	86	75	83.2	84.6	8.24	209.3	1.46	19	17	6			185.40	6.18	51
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. Pahang ...	74.4	62.5	68.5	78	60	67	64	70.8	71.8	5.03	127.8	1.21	16	13		1	2	142.25	4.74	39
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.6	56.5	64.1	75	51	67	62	70.2	69.9	10.03	254.8	1.68	23	20	1		1	122.50	4.08	34
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	70.7	58.7	64.7	74	56	65	60			10.37	263.4	1.71	21	19			1	132.40	4.41	36

Compiled from Returns supplied by the Meteorological Branch, Malaya

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ORIGINAL ARTICLES.

ABSTRACT.

REVIEWS.

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STATISTICAL.

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THE

Malayan Agricultural Journal.

DECEMBER, 1934.

EDITORIAL.

Malayan Rice Production.

With the conclusion of the 1933-34 season for padi production in Malaya, the time is ripe for an annual review of the progress of the work performed at the numerous rice experiment stations throughout Malaya.

Those who study at all closely the articles, which appear in the pages of this Journal from time to time, on the conduct, progress and achievements of the rice work of the Department, will realise that there is to-day close co-ordination in the work throughout the country. The method which now obtains, of conducting similar experiments in many centres, enables more reliable conclusions to be drawn therefrom, and the contrast of results obtained under the differing local conditions, as well as the similarities which become evident in spite of varying local factors, frequently emphasise points which under other conditions might be less evident, or - in fact - overlooked.

The review of the season's work and results will be published in three articles, the first of which, entitled "Padi Manurial Experiments 1933-34" is included in this number.

Experiments on the manuring of padi have been made from time to time in various parts of Malaya. The results have at best been inconclusive. It must be remembered that manurial experiments with an irrigated crop, such as padi, present unique difficulties to overcome which special technique is necessary.

From the series of experiments which have been made on the subject of manuring of "wet" padi, emerge two facts of significance. The more important of these facts is the bar to higher yields which is found to apply to almost all padi areas in Malaya. There are, however, isolated areas where yields considerably higher than the bar are usual; the knowledge of the existence of such areas is a starting point for further investigations having for their object the elimination of the causes restricting crop production.

The second fact which has so far emerged from investigations is that where manuring has given an increased yield, phosphorus has been the essential element. The form in which this fertilizer should be applied, in what quantities, and at what time, are questions under consideration.

The importance of cultivation and the reaction of manures to conditions of cultivation of the crop are widely recognised. The present series of experiments has, therefore, been designed to give due weight to these factors. Although finality has not yet been reached, considerable progress has been made and in some instances, definite recommendations can be made regarding economic manuring of the padi crop.

Pollination of Oil Palms.

An oft-discussed but imperfectly understood subject of discussion centres on the pollination of the oil palm. The subject is, however, of such great importance that the planter cannot afford to neglect any aspect of it. He is committed to a policy of obtaining the maximum yield of fruit commensurate with the maintenance of vitality and normal development of the palm, but is handicapped by a not very precise knowledge of the method of natural pollination, of the normal or natural fruiting ability of the palm at different ages, or of the degree of artificial pollination which is advisable; if, in fact, taking a long view, artificial pollination is at any time justified.

Although we may feel how incomplete our knowledge is on this subject, the accumulated evidence of the past few years appears to counsel a conservative policy of artificial pollination. This policy receives further support from the observations of Mr. R. B. Jagoe, described in an article on the subject of pollination of oil palm, which is included in this number. The author contends that the oil palm is almost entirely wind-pollinated and shews that on an oil palm plantation, naturally wind-borne pollen is likely to provide the optimum pollination. On young palms, natural pollination may be less complete and artificial pollination will, therefore, result in greatly enhanced crops.

Organisation of Weekly Fairs.

H. H. Tunku Yacob, a son of H.H. The Sultan of Kedah, has prepared, at our request, a comprehensive account of the organisation of weekly fairs in the State of Kedah. By virtue of his official post of Assistant Principal Agricultural Officer, Kedah, the author has been intimately connected with the transforming of the earlier efforts to establish such fairs into the present organised and efficient system.

Weekly fairs have been started in many parts of Malaya. In some cases they have proved successful; in many others, interest has waned after the first flush of enthusiasm. But whether they have succeeded or failed, their desirability is admitted, and we suggest to those concerned that the experience obtained in Kedah will repay careful study.

The author has placed at our disposal much additional information concerning the conduct and development of these fairs in Kedah. Space forbids the presentation of all these facts in this Jounral. Many of them are of local value, but readers who desire to examine this subject in greater detail, with a view to the development of similar fairs in other States, would be well-advised to get into touch with this Department when all available information will be forthcoming.

Original Articles.

PADI MANURIAL EXPERIMENTS 1933-1934

BY

W. N. C. BELGRAVE,

Chief Research Officer.

Summaries of results of manuring of padi have been given in this Journal for December 1932 and 1933. Once again the writer wishes to make it clear that the various Officers in charge of Stations should be regarded as co-authors of this series of articles.

The deductions drawn from previous experimental work were—

(*a*) That whenever fertilizers gave results, phosphorus was found to be the essential element.

(*b*) That there appeared to be a bar above which yields could not be raised by any system of manuring likely to be economic, either alone or in conjunction with close planting. The bar apparently varied from 400 to 550 gantangs (2,200 to 3,000 pounds) per acre, depending on soil type and water conditions and where, as is generally the case on the Stations, the normal yield approaches the hypothetical bar, manuring with commercial fertilizers gave only uneconomic increases.

Results in tanks indicated a considerable effect from the late addition of green matter on the surface of the soil and a similar good effect is observed from the bunds of cut vegetation used in the Krian District.

For the season under review, a complex experiment was accordingly designed to test the effect of the addition of green matter combined with manuring and with different forms of surface cultivation (this last at the suggestion of the Director of Agriculture).

Cultivation.—This took the form of (i) "changkolling"* to a depth of 6 in. to 7 in. as early as practicable before planting, designated "CE" (changkol early), (ii) similar treatment carried out as late as possible, "CL" and (iii) "tajaking" (in which existing vegetation was cut near or just below the inundated surface) just before planting, "T".

On the early changkolled plots, growing weeds or straw on the surface at the time of changkolling were turned in and just before planting these plots were either (*a*) re-changkolled wet to a depth of 5 in. to 6 in., the existing weed growth being buried (G. B.—*i.e.* green manure buried) or (*b*) re-changkolled very lightly or, if possible, tajaked—cut weeds remaining on or very near the surface (G. S.).

---

* Cultivation with a mattock or digging hoe, locally termed *chankol.*

On the late changkolled plots, the plots had either (*a*) vegetation buried, (G. B.) or (*b*) vegetation cut and removed before changkolling and afterwards replaced on the surface (G. S.).

On the tajaked plots, vegetation was all left on or near the surface (G.S.).

There were thus five surface treatments :—

C.E. G.B.; C.E. G.S.; C.L. G.B.; C.L. G.S.; and T. G.S.

Plots carrying each of these treatments were divided into half-manured (M) and unmanured (O). Manured plots received a dressing at the rate of 100 lbs. sulphate of ammonia and 200 lbs. superphosphate per acre. These sub-plots were 1/120th acre each.

The lay-out was as follows:

Direction of Water Flow ↓

<table>
<tr><th>Columns</th><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th></tr>
<tr><td>Rows
I</td><td>C|E
G|S
O|M</td><td>C|E
G|S
M|O</td><td>C|L
G|S
M|O</td><td>C|L
G|S
O|M</td><td>T
G|S
M|O</td></tr>
<tr><td>II</td><td>C|L
G|S
O|M</td><td>C|L
G|B
M|O</td><td>T
G|S
M|O</td><td>C|E
G|B
O|M</td><td>C|E
G|S
M|O</td></tr>
<tr><td>III</td><td>T
G|S
O|M</td><td>C|L
G|B
M|O</td><td>G|E
G|S
M|O</td><td>C|E
G|B
O|M</td><td>C|L
G|S
M|O</td></tr>
<tr><td>IV</td><td>C|E
G|S
O|M</td><td>C|E
G|B
M|O</td><td>C|L
G|S
M|O</td><td>C|L
G|B
O|M</td><td>T
G|S
M|O</td></tr>
</table>

Double lines indicate bunds.

It will be noted that the lay-out is not strictly randomised; it was desired to avoid diffusion of nutrients as far as possible. The departure from strict randomisation was of less importance than it might normally have been in that the object of this somewhat elaborate experiment was to look, not for increases of the order of 10 or 20 per cent., but for large increases of yield which would suffice to take yields over the hypothetical bar.

On some of the Stations, the shape of the available land did not permit of the key-plan being strictly followed and columns or rows were placed end to end.

In Malacca there is little or no inter-season weed growth and extraneous non-leguminous green matter was brought in and used at the rate of 10 tons per acre.

The main experiment was carried out at the Experimental Stations at Titi Serong and Talang in Perak, Bukit Merah in Province Wellesley, Pulau Gadong in Malacca, at the Departmental Test Plots of Briah and Kuala Kurau in Krian, and, by the courtesy of the Kedah Government, at the Telok Chengai Station in that State. Results and general observations are as follows:—

Kedah.

Telok Chengai. Padi used: selected strain Radin 2. The area selected for the experiments had not been manured for three seasons, but had during this period been well cultivated by the usual methods of ploughing, raking and rolling and all straw had been returned to the soil.

Operations were carried out as follows:—

"C.E." Changkolled to a depth of 6in. to 7in, 16 weeks before planting. Re-changkolled 10 days before planting.

"C.L." Changkolled 11 days before planting.

"T." Tajaked 28 days before planting.

Manures were applied 3 days before planting.

The plots changkolled early made the best growth, but as will be seen later, did not give highest yields. The results are shewn in Table I.

Table I.

Cultivation and Green Manuring Experiment at Telok Chengai, Kedah. Mean Yields in Pounds of Padi.

Treatment	Pounds per 1/120th acre.		Pounds per 1/60th acre. Manured + Control	Gantangs per acre*
	Manured	Control		M + O
C.E. G.B.	21.8	20.5	42.3	442
C.E. G.S.	24.0	21.2	45.2	472
C.L. G.B.	20.0	17.9	37.8	399
C.L. G.S.	24.5	22.0	46.4	484
T. G.S.	24.9	23.3	48.2	508

* Calculated from weight of samples from each treatment which ranged from 5.68 to 5.75 pounds per gantang.

As manures gave only small increases ranging from 6.5 to 13.6 per cent. and as inspection shows interaction between manures and treatments to have been absent, results were not statistically analysed with respect to manures but only with respect to treatments. This analysis showed significant differences to have occurred and the minimum difference required for significance ($P = .05$) between any two treatments to be 3.0 lbs.

The real inferiority of green matter buried may possibly be ascribed to the ill effects of products of anaerobic decomposition, or to locking up of available supplies of nitrogen as a result of enhanced growth of the soil flora. The inferiority of early changkolling might be conceived to be due to the stirring up of toxic sub-soil, but for the facts that these plots showed superiority of early growth when toxicity should have been at its maximum and that padi roots normally penetrate below 6 or 7 inches, the limit of cultivation in this experiment.

Perak.

Titi Serong, Briah and Kuala Kurau. The experimental plots at Briah suffered from such severe rat damage that no deductions can be drawn from the results obtained. At Titi Serong, owing to the shape of the experimental block, the lay-out was modified by placing the 3rd, 4th and 5th columns of the key-plan above the 1st and 2nd. At the time it was not realised that the effect of the bunds of decaying vegetation used in the District was as extensive as observation on another experiment proved it to be, and the possibility exists that the outer columns were unduly favoured—as these all had green matter laid on the surface, any excess in yield of this treatment would be under suspicion. As a matter of fact, the run of yields in the sub-plots indicated that there was little or no bund effect in this block, even the outermost columns being too far from the bunds for it to manifest itself, but the results cannot be regarded as absolutely above suspicion.

At Kuala Kurau the standard lay-out was adopted.

At all three Stations early changkolling was done 17 weeks, and late changkolling 2 to 3 weeks before planting; tajaking, following local procedure, was carried out 5 to 6 weeks before planting. Results given in Table II have not been analysed as there are obviously no differences of the order sought—inspection suggests that minimum differences for significance would not exceed 15 per cent. of the mean.

The early changkolled plots showed better vegetative growth but this was not reflected in yield.

Talang.

The lay-out had to be varied at this Station by placing columns C, D and E at right angles to A and B; the direction of water flow was in both cases down the column.

Table II.

Cultivation and Green Manuring Experiment at Titi Serong and Kuala Kurau Stations. Mean Yields in Pounds of Padi.

Treatment	Titi Serong			Kuala Kurau		
	Manured 1/120th acre	Control 1/120th acre	Total 1/60th acre	Manured 1/120th acre	Control 1/120th acre	Total 1/60th acre
C.E. G.B.	24.6	15.1	49.7	31.4	31.4	62.8
C.E. G.S.	27.6	24.1	51.7	31.3	29.1	60.4
C.L. G.B.	23.4	24.0	47.4	28.3	28.6	56.9
C.L. G.S.	24.3	22.0	46.3	30.0	28.1	58.1
T. G.S.	25.8	25.6	51.4	28.1	30.5	56.6

Early changkolling was carried out 18 weeks before planting; re-changkolling, late changkolling and tajaking and manuring at the time of planting.

Ripening was uneven and the harvesting period was unduly prolonged, extending over three weeks. The results are shewn in Table III.

Table III.

Cultivation and Green Manuring Experiment at Talang Station. Mean Yields in Pounds of Padi.

Treatment	Mean Yield Pounds per 1/120th acre		Mean Yield Pounds per 1/60th acre	Gantangs per acre (calculated)
	Manured	Unmanured	M + O	M + O
C.E. G.B.	26.2	22.5	48.7	532
G.S.	23.8	19.4	43.2	471
C.L. G.B.	22.6	16.8	39.5	430
G.S.	24.4	21.8	46.2	504
T. G.S.	21.3	18.4	39.7	432
Mean	23.7	19.8		

Minimum differences for significance are for manures 1.13 pounds per 1/120th acre and for treatments 6.0 pounds per 1/60th acre. There is no significant interaction between treatments and manures.

Province Wellesley.

Bukit Merah. Columns had to be displaced to fit available land. Early changkolling was carried out 13 weeks and re-changkolling immediately before planting, late changkolling 4 weeks and tajaking 2 weeks before planting. Results are given in Table IV and the minimum difference for significance between any two treatments is 9.5 pounds per 1/60th acre.

Table IV.

Cultivation and Green Manuring Experiment at Bukit Merah Station. Mean Yields in Pounds of Padi.

Treatment	per 1/120th acre		per 1/60th acre
	Manured	Control	Total
C.E. G.B.	22.5	24.2	46.7
C.E. G.S.	25.9	26.3	52.2
C.L. G.B.	18.6	21.7	40.3
C.L. G.S.	23.0	25.8	48.8
T. G.S.	23.7	24.7	48.4

Malacca.

Pulau Gadong.—Early changkolling was carried out four weeks before planting in the field, final preparation of "C.E." and sole cultivation of "C.L." and "T." plots from seven to seventeen days and manuring seven days before planting.

Minimum difference of significance between any pair of treatments is 8.2 lbs. and for manured over unmanured plots as a whole 1.5 lbs. The "Z" value for interaction is less than that required for significance, a somewhat surprising result in view of the considerable difference in the effect of manure in C.E. G.B., and T. G.S. This absence of significance is attributable to considerable variation within C.E. G.B.

Table V.

Cultivation and Manuring Experiment at Pulau Gadong Station. Mean Yields in Pounds of Padi.

Treatment	Mean Yield. Pounds per			Gantangs per acre (calculated)
	1/120th acre		1/60th acre	
	Manured	Unmanured	M + O	M + O
C.E. G.B.	23.5	23.5	47.0	510
C.E. G.S.	24.4	20.4	44.8	487
C.L. G.B.	25.4	24.7	50.1	546
C.L. G.S.	23.8	20.9	44.7	487
T. G.S.	25.0	19.4	44.4	483
Mean	24.4	22.3		

General.

Very clearly in no single instance have the treatments undertaken given the substantial increases sought. In view of the possibility that deep cultivation may have a delayed beneficial action it has been decided for the coming season to treat all the plots in these experimental blocks uniformly according to the system adopted locally, *e.g.* tajak in Krian, plough and rolling in Malacca and so on. Any residual effect should thus be found.

Other Manurial Experiments.

In addition to the main experiment other simpler experiments were carried out at some of the Stations; these are described below.

Kedah.

Effect of Phosphate Fertilizers. Experiment to test the economic results, if any, likely to accrue at the present low price of padi, from application of phosphate fertilizers known to give 10 to 20 per cent. increase of yield.

A four-way Latin Square of 1/120th acre plots was laid down with the treatments and results given below on land at Telok Chengai Station which had received no manure for the past three seasons.

Difference required for significance between any two treatments (P = .05) = 2.4 lbs. per 1/120th acre.

Table VI.

Phosphate Fertilizer Experiment at Telok Chengai Station.

Treatment	Rate pounds per acre	Yield	
		Pounds of Padi per 1/120th acre	Gantangs of Padi per acre (calculated)
I. Control		14.9	356
II. Bat guano * 21.9 per cent. I P_2O_5	500	20.1	416
III. - do - II	250	19.0	395
IV. Superphosphate 18 to 20 per cent. P_2O_5	200	21.9	454

The land was ploughed, raked and rolled prior to planting.

The cost of the local phosphate including freight was $5.04 per ton; that of superphosphate was $55 per ton. With padi at 5 cents per gantang, profit was: local phosphate 500 lbs. $2.63 per acre, 250 lbs.—$2.14 per acre and superphosphate $0.74 per acre. This shows that the local practice of drawing on local deposits is justified when the unmanured yield is of the order of 350 gantangs or less, more especially as some residual effect is certain. Comparison of this simple experiment with the main experiment furnishes yet another indirect confirmation of the existence of the bar. In the main experiment, unmanured yields were higher, ranging from 17.9 to 23.3 pounds per 1/120th acre, and increases due to manures were correspondingly smaller, ranging from 1.3 to 2.8 pounds per 1/120th acre.

Residual Effect. Early in the season it was noticed that the padi on the plots manured in 1932—1933 for the planting distance experiments (described on page 633 of this Journal for December, 1933) was making better progress than that on the unmanured plots. Yields of the old plots were in consequence recorded. No manure was applied in 1933-1934.

* This so-called guano contains so little nitrogen that it may be regarded as a purely phosphatic manure.

Table VII.

Residual Effect of Fertilizers on Padi, Telok Chengai Station, Yields of Padi in the Season 1933-34.

Treatment 1932-33	Yield 1933-1934	
	Pounds per 1/40th acre	Gantangs per acre calculated.
I. "Chellup"	65.1	482
II. Superphosphate 360 lbs. per acre	70.3	520
III. Super + ammonium sulphate as II + 110 lbs. ammonium sulphate	71.4	529
IV. Control	63.8	472

The Z value was .50 against .68 (P = .05) required for significance, but the minimum difference for significance required is 7.6 lbs. per 1/40th acre *i.e.* there is a strong probability, not amounting to odds of 20 :1, that significance has been attained by II and III.

It must be remembered that the application of phosphate was heavy.

At Langgar in Kedah, a purely exploratory experiment was laid down in which four different varieties of padi were tried, arranged in a four-way Latin Square; two plots of each variety received 1,000 lbs. per acre of local phosphate. (This is the usual local application, repeated every third year).

Assuming, and there is evidence for the assumption, that there is no differential response of varieties to manuring, analysis shows that the increase obtained was significant; mean yield of manured plots was 21.5 lbs. per 1/120th acre and of unmanured 17.2 pounds.

Kelantan.

Pasir Puteh. A. Last year an experiment of six randomised blocks of 1/40th acre plots was carried out at this Station and described on page 635 of the December 1933 *Malayan Agricultural Journal.* This season the plots were observed for residual effect, except those carrying treatments 5 and 6, which received 5 tons green manure and 2 cwts. local phosphate per acre respectively. The results are given in Table VIII.

Table VIII.
Residual Effect of Fertilizers on Padi, Pasir Puteh Station. Mean Yields of Padi.

Treatment - 1932 - 1933.	per 1/40th acre 1932-33	per 1/40th acre 1933-34	Gantangs per acre (calculated)* 1933-1934
1. Basic slag 2 cwts. cyanamide 1½ cwts. sulphate of potash 1 cwt. per acre	64.3	45.6	332
2. Superphosphate (16 per cent.) 2 cwts.	55.2	42.8	311
3. Superphosphate + sulphate of ammonia 1½ cwts.	58.5	44.8	326
4. Basic slag 2 cwts. + cyanamide 1½ cwts.	57.5	46.4	337
5. Green manure 1 ton	44.7	46.8	340
6. Local manure†	41.0	40.8	297
7. Local bat guano (P_2O_5 16 per cent. N 1.8 per cent.) 4 cwts.	56.3	45.0	327
8. Control	33.8	34.8	253

Minimum difference for significance between any two treatments = 9.3 lbs. per 1/40th acre. Minimum increase over control for significance = 6.6 lbs. per 1/40th acre.

All treatments showed a significant increase, or significant residual effect, over the control.

B. In view of the large increase obtained by the use of local phosphate in 1932—1933, a simple experiment consisting of two three-way Latin Squares was laid down with plots of 1/120th acre each. The land had previously been used as a nursery and had received a uniform dressing of 1½ cwts. Niciphos per acre. Applications and results are shown in Table IX.

* Calculated from weight at the rate of 1 gantang = 5.5 lbs.

† A mixture of burnt soil, burnt cow dung and ashes of coconuts and areca leaves in general use in Kelantan under the name "Baja Bakar".

Table IX.

Manuring with Local Phosphate at Pasir Puteh Station. Mean Yields of Padi.

Treatment	Mean Yield pounds per 1/120th acre
Square A.	
Control	12.0
Bat Guano * 1 cwt. per acre	11.2
Bat Guano 2 cwts. per acre	11.0
Square B.	
Control	13.0
Bat Buano 3 cwts. per acre	14.5
Bat Guano 4 cwts. per acre	16.3

Variation was so great that no increases were significant. (The undesirable statistical lay-out was imposed by the lie of the land).

The small response from even as much as 4 cwts. of fertilizer per acre is surprising.

Central Experiment Station. Experiments were laid down to test a number of acid and basic mixtures, cow dung and green manure on (*a*) dry and (*b*) wet padi, (*c*) the optimum rate of application of local phosphate and (*d*) the optimum N/P ratio.

There was extensive lodging with some loss of seed, and bird and rat damage; for this reason, and because there are no differences of importance between the yields from various treatments and the controls, analysis has not been undertaken, and detailed results are not given.

Treatments were as follows:—

Experiments A and B were laid out in four six-way Latin Squares, two with dry and two with wet padi on 1/40th acre plots. The results are stated in Table X.

* Containing P_2O_5 8 per cent. and N 0.8 per cent.

Table X.

Manuring "Wet" and "Dry" Padi at the Central Experiment Station, Kelantan.

Mean Yield pounds of Padi per 1/40th acre.

Treatment	Rate per acre	Dry Padi	Wet Padi
1. Cyanamide Basic slag Sulphate of potash	1½ cwts. 2 „ 1 „	42.5	59.5
2. Superphosphate	2 „	45.6	64.8
3. Superphosphate Sulphate of ammonia	2 „ 1½ „	46.8	56.3
4. Basic slag Cyanamide Followed 1 month later by an additional 1 cwt. cyanamide	2 „ 1½ „	46.3	58.3
5. Basic slag Cyanamide	2 „ 1½ „	49.3	63.5
6. *Control*		*48.1*	*61.3*
7. Green manure Bat guano	10 „ 3 „	48.8	56.7
8. As 7 + sulphate of potash	1 „	47.8	62.6
9. Bat guano Sulphate of potash	3 „ 1 „	45.7	61.6
10. Cow dung	5 tons	51.3	62.0
11. Local manure		47.9	63.7
12. *Control*		*46.1*	*61.5*

Experiment C with "wet" paḍi was laid out as a four-way Latin Square with 1/60th acre plots. Results are stated in Table XI.

Table XI.

Experiment in Optimum Rate of Application of Local Fertilizer at the Central Experiment Station, Kelantan.

Treatment	Rate per acre	Mean yields pounds of Padi per 1/60th acre.
Bat guano	1 cwt.	59.1
" "	2 cwts.	59.6
" "	3 "	55.4
Control		57.6

Experiment D with wet padi was laid out in a four-way Latin Square with plots of 1/60th acre. Means ranged from 37.9 pounds to 58.2 pounds per 1/60th acre, but there was considerable loss of grain and such great variation between plots that the results are valueless.

Province Wellesley.

Bukit Merah. Three additional experiments were carried out at Bukit Merah :—

(*a*) a simplified version of the main experiment, on land used to test the possibilities of inter-season cultivation of vegetables.

(*b*) an experiment to test the effect of cattle manure.

(*c*) an experiment to compare different methods of preparing the land.

A. Late changkolling, with and without turning in of green matter, was compared with tajaking in three replications on plots of 1/80th acre divided into sub-plots of 1/160th, manured and unmanured. Limitation of space prevented further replications on larger plots. Results are shewn in Table XII.

Table XII.

Cultivation and Manuring Experiment at Bukit Merah Station. Mean Yields of Padi in Pounds.

Treatment	Mean yield pounds		
	Per 1/160th acre		Per 1/80th acre M. + O.
	Manured	Unmanured	
C.L. G.B.	23.2	23.4	46.6
C.L. G.S.	23.8	23.5	47.3
T. G.S.	24.1	24.5	48.6

Obviously there are no significant differences; from inspection the experimental error is small.

The mean yield is high, of the order of 680 gantangs per acre. Unfortunately, this piece of land is the most favoured by water supply on the Station, so that the part played by the intensive cultivation incidental to vegetable cultivation cannot be estimated.

B. A four-way Latin Square with plots of 1/120th acre was laid down as in the season 1932—1933 (this Journal page 637, December 1933) except that lime was omitted from treatment C. Results are stated in Table XIII.

Table XIII.

Manuring Experiment at Bukit Merah Station. Mean Yields of Padi in Pounds.

Treatment	Rate per acre	Mean Yield		Mean Yield 1932—1933 Gantangs per acre. (calculated)
		Pounds per 1/60th acre	Gantangs per acre (calculated)	
A. Cattle manure	20 tons	28.9	630	510
B. „ „	2½ „			
+ ammonium phosphate 20:20	100 lbs.	26.0	566	475
C. Ammonium phosphate	300 „	26.4	573	435
D. Control		24.5	535	368

Minimum difference for significance between any two treatments = 2.6 lbs. per 1/120th acre. Minimum increase over control for significance = 1.8 lbs.

C. An experiment to compare ploughing, changkolling and tajaking, gave no significant differences as is shewn in the results stated in Table XIV.

Table XIV

Effect on Yield of Padi of Method of Cultivation. Bukit Merah Station.

Season	Ploughing Per cent.	Changkolling Per cent.	Tajaking Per cent.
1931—32	108	102	100
1932—33	123	113	100
1933—34	105	98	100

Perak.

Selinsing. The experiment to test tajaking against changkolling combined with manuring reported last year (page 638 *loc. cit.*) was repeated. Mean results in pounds of padi per 1/80th acre are stated in Table XV.

Table XV.
Cultivation and Manuring Experiment at Selinsing Station. Mean Yields of Padi.

Treatment	Control	P	N. P.	Mean
Changkol	28.4	32.4	31.1	30.4
Tajak	20.4	24.2	25.0	23.2
Mean	24.4	28.3	28.1	

The minimum significant difference between changkol and tajak is 3.1 lbs. and between manures 3.4 lbs.

Last season changkolling was done after water was on the land; this season it was done during fallow.

Summary.

Once again attempts to lift yields over the "bar" have failed. Were it not for the existence of small patches of land regularly giving authentic yields of the order of 800 gantangs (4,400 pounds) per acre, it might be assumed that climatic conditions precluded really high yields of the order of those obtained in Japan, Spain and Italy. Such patches do, however, exist and investigation must continue.

The most promising result of the season's work is the fact which emerges from the Kedah experiment with local bat guano, that economic results may follow manuring with water-insoluble phosphates if, in spite of favourable water and weather conditions, yields do not approach within fifty gantangs of the "bar" and if fertilizer can be cheaply obtained.

Hitherto, only districts in close proximity to local deposits could benefit, imported fertilizers being far too expensive for this purpose. Recently, however, it has become possible to obtain locally, finely divided imported rock phosphate (P_2O_5 content 39 per cent.) at rates which, with properly organised distribution to avoid excessive middleman's profit, should not exceed $1.60 to $1.80 per cwt. in padi districts. Should experiments show that this material is efficient for the purpose, (and there is reason to believe that it will be) fifty gantangs increase, with padi even at six cents, would show a profit.

It is proposed to test this fertilizer during the 1934—1935 season.

OBSERVATIONS AND EXPERIMENTS IN CONNECTION WITH POLLINATION OF OIL PALMS

BY

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A question of considerable importance on many oil palm estates in this country is whether an increase in fruit production is obtained as a result of artificial pollination of the flowers of female inflorescences, or whether the amount of natural pollination which occurs provides the maximum economic yield.

As an approach to an examination of this subject, a study of the way or ways in which natural pollination is effected, was initiated.

Oil palms are undoubtedly wind pollinated. It has been stated occasionally, however, that various insects may also be concerned with pollination. This contention is probably largely due to the strong smell of aniseed given off by fresh pollen, and in a lesser degree, by receptive female flowers. (1) (2) (3) (4) (5).

The large monoecious inflorescences, the great abundance of small, dry, smooth pollen grains, the inconspicuous female flowers with large, slightly hairy stigmas, protruded and exposed at maturity, all indicate wind pollination (6).

Although neither the anthers nor the male inflorescences are easily disturbed by wind, nevertheless the inflorescences are borne on stalks long enough to project them well up from the axils of the leaves and produce pollen in such great quantities and over such large and exposed surfaces, that the wind can easily and gradually bear it away.

There is nothing to prevent successful pollination by almost any insect, but neither does there seem to be any property of the female flower to attract insects, except for the mild scent of aniseed.

A possibility, of course, is that winged pollen-feeders (certain beetles and flies) attracted to the male flowers in the first place by their stronger scent, might subsequently alight on a nearby female flower in pursuit of the same smell.

No recorded observations have clearly shown this, however, and pollen-collectors, such as bees, are very rarely seen in the vicinity of female inflorescences.

Although the aniseed smell not unnaturally incites attempts to find a reason for it connected with insect pollination, it is probable that logical examination must go further back.

According to Strasburger, certain characters of the flowers of angiosperms, such as attractive scents and coloured perianths, owe their origin to the occurrence of similar or analogous phenomena in a primitive ancestor at anthesis* only, these characters having been further developed when circumstances arose which proved them to be of value by attracting insects to assist in pollination (6) (7) (8).

It is probable, therefore, that the scent of aniseed from both male and female oil palm flowers is an undeveloped primitive character incidental with increased vitality at anthesis, but not directly concerned with pollination.

The abundance of pollen on male inflorescences is bound to attract a number of insects, especially bees, and those most commonly seen locally, visiting male inflorescences are *Apis indica,* F. the small honey bee, *Melipona laeviceps,* Sm. the small damar bee, and *Apis dorsata,* L. with long abdomen.

The first-named is the most conspicuous, but the second may often be seen in some numbers collecting the oil palm pollen which they carry away on their legs.

These bees do not visit female flowers, nor has the writer seen any winged insects on female inflorescences, though a few have been recorded by entomologists. (9) (10).

Frequently at night, a small moth, *Pyroderces centrophanes* Meyr. (Cosmopterygidae) (11) may be seen in large numbers on and about male inflorescences with freshly opened flowers. They lay their eggs in the pockets left by the extruded anthers, having been attracted to the inflorescences probably by the scent of the fresh pollen.

The only common insect recorded as a visitor to both male and female flowers in Africa is a small weevil (*Derelomus* sp.). Attempts have been made to connect this insect with pollination (1). It is stated that though it chiefly visits male inflorescences, it sometimes lays its eggs in female flowers (12).

Apart from the fact that it is chiefly the male inflorescences that this weevil visits, it is reasonable to assume that any value it may have as a pollinator, would be offset by the damage done in laying its eggs in the female flowers.

While the above observations were being recorded, an examination was also being made of the dispersal of the pollen by wind.

Several methods for measuring the density of pollen in the air were tried, but were found difficult to control, and were abandoned in favour of exposing slides during measured periods of time to obtain, by counts of captured pollen grains, an estimate of the deposition of wind-borne pollen.

The period of flowering on both male and female inflorescences is usually five days, but individual female flowers have been recorded as remaining receptive for three days only.

In order, therefore, to make an estimation of the amount of pollen in the air available for pollination of female flowers, a three-day exposure of slides was made at a fixed point in an oil palm plantation.

*** Anthesis—The opening of the flowers, or flowering, including particularly the receptive period of the female reproductory organs and the ripening of the anthers.**

The site chosen was at the base of a low hill facing west, in a small valley running south by west and north by east, and was fairly well exposed to the prevailing winds. A small board was hung as a shelf, on a mature palm, beside a female inflorescence, at a height of 10 feet from the ground.

Male inflorescences were noted on palms at distances of 28 feet and 50 feet; the further inflorescence being in the fourth day of flowering and situated to the south-west of the shelf, while the nearer inflorescence, to the east of the shelf, was just beginning to flower.

Ordinary 3 inch x 1 inch glass slides were used, and the central 2 inches of one side of each slide were coated with a mixture of four parts egg albumen to one part glycerine, spread on with a small paste brush.

Six slides, spaced three inches apart at marked positions on the shelf, were used for each exposure, and the first six slides were placed on the shelf at 11 a.m. on the first day. (21-2-33). Slides were changed each hour for the first eight hours, but exposures were then altered to two-hourly periods, which degenerated into four-hourly periods during the first night.

A table of results shows the amount of pollen collected at each exposure, with accompanying notes on variations of wind by personal observation only, as meteorological instruments were not available. Accurate records of wind and other phenomena would possibly have been more instructive.

Table of Results.

Date.	Hour (Suntime)*	No. of Pollen Grains.	Weather Observations.
21-2-33	11 a.m. to 12 noon	6	Gentle intermittent breezes.
	12 to 1 p.m.	5	
	1—2	1	
	2—3	2	
	3—4	0	
	4—5	12	Breeze stronger and a bit
	5—6	15	gusty.
	6—7	29	
	7—8)		Calm.
	8—9)	102	
	9—10)		
	10—11)	60	
	11—12 Midnight)		Very gentle breeze.
22-2-33	12—1 a.m.)	87	
	1—2)		
	2—3)		
	3—4)		
	4—5)	238	Calm.
	5—6)		
	6—7)		
	7—8)		
	8—9)	40	Gentle breezes.
	9—10)		
	10—11)		

* Official time in Malaya is 20 minutes in advance of sun time.

Date.	Hour (Suntime)	No. of Pollen grains.	Weather Observations.
22-2-33	11—12 noon 12—1 p.m.	88	Calm.
	1—2 2—3 3—4 4—5	31	Freshening.
	5—6 6—7 7—8 8—9	49	Rain.
23-2-33	9—10 10—11 11—12 midnight 12—1 a.m.	0	Very heavy rain. (No exposure of slides). Calm.
	1—2 2—3	27	
	3—4 4—5 6—7 6—7	30	
	7—8 8—9 9—10 10—11	76	Light gusty breezes.
	11—12 noon 12—1 p.m.	65	
	1—2 2—3	18	Very heavy rain. (Slides sheltered from the force of the rain). Calm.
	3—4 4—5 5—6 6—7	28	
	7—8 8—9 9—10 10—11	12	Gentle breezes.
24-2-33	11—12 midnight 12—1 a.m. 1—2 2—3	44	
	3—4 4—5 5—6 6—7	24	Windless and sultry.
	7—8 8—9 9—10 10—11	35	Gusty wind.

Wind rose about 11 a.m. on the 21st February as gentle intermittent breezes; was rather stronger and gusty that afternoon between 4 p.m. and 7 p.m. There was just enough to stir the leaves of the palms at about midnight when the near-by male inflorescence was exposing pollen freshly.

There was very little wind during the morning of the 22nd but it freshened at about 5 p.m. and there was rain from 9 to 11 a.m. It was calm during the night but at 9.30 a.m. on the 23rd, light gusty breezes sprang up. There was heavy rain from 1 p.m. to 3 p.m. and the rest of the afternoon was calm. At 11 o'clock that night, very gentle breezes arose again, but died away altogether towards the morning which was windless and sultry. There was a little more gusty wind at 10.30 a.m.

The average deposition of pollen is here shown to be 15.6 grains per 12 square inches per hour, or a little over one grain per square inch per hour. In other words, 94 grains per square inch were deposited in three days and this illustrates the quantity of pollen available for pollination over the period for which the female flowers are usually receptive.

The greatest amount of pollen was deposited from 1 a.m. to 5 a.m. on the 22nd February, but on one of the six slides a total of 172 grains was counted, most of which was in groups of from six to twenty grains. It occurred in a period of calm following some wind disturbance and may, therefore, need no other explanation, especially as this also coincided with the full flowering of a nearby male inflorescence; but as the other slides showed only 19, 2, 9, 12 and 24 grains respectively, it is possible that a bee, with pollen on its legs after visiting a male inflorescence, had in some accidental manner stumbled on to this slide.

This slide alone, however, does not affect the general conclusion, for though its elimination from the total count would reduce the average from 94 to 79 per square inch for three days, there is little practical difference between these figures.

This first experiment was conducted in February 1933 in the small area of oil palms in the Kuala Lumpur plantations and at the time the palms had few male inflorescences in flower.

Subsequently, similar series of exposures of slides were made in the much larger area at the Central Experiment Station, Serdang, during November 1933, and in a large estate during July, 1933.

On both these occasions an anemometer was used and was fixed near the crown of the palm on a level with the inflorescences and the tray of slides. In this position, however, it measured only the amount of wind in very localised eddies and was a poor index of the actual wind. A second anemometer up above the tops of the palms would have been necessary for accurate wind records.

Slides were exposed as described for the experiment in Kuala Lumpur, except that the mixure of egg albumen and glycerine was altered to three parts glycerine to two parts egg albumen, and was spread on the slide more thinly.

Furthermore, as it was decided that three hours was the most suitable period for successive exposures of slides, this period was adhered to throughout both these later experiments.

The estate in question covers an extensive area of undulating land and is, for the most part, well exposed to winds from any direction.

The site chosen for the experiment was on the western side of a hill in the centre of the estate, typical of the conditions of the estate.

The first six slides were exposed at 2 p.m. on the 5th July, 1933, and a fresh batch of slides was exposed every three hours up to and including 11 a.m. on the 8th July.

Male inflorescences which were in various stages of flowering from just commencing to almost over, were noted on palms at the following distances from the palm on which the slides were hung:—36 feet S.E., 225 feet W by N., 150 feet S.S.E., 130 feet E. by N., 100 feet N., 75 feet N. by E., and 35 feet N.E.

The "counts" of pollen obtained are as follows:—

Date.	Hour (Suntime)	No. of Pollen grains. (On 12 square inches.)	Humidity. per cent.	Temp. °F.	Weather Observations.
5-7-33	2 p.m.	—	72	85.2	Fresh breeze.
	5 "	190	73	84.0	Light shower of rain.
	8 "	63	95	77.1	Gentle breezes.
	11 "	45	99	75.3	Calm.
6-7-33	2 a.m.	38	95	75.0	Gusty wind.
	5 "	206	98	74.0	Calm.
	8 "	59	91	77.0	"
	11 "	20	70	85.6	"
	2 p.m.	18	69	87.2	Gentle breezes.
	5 "	18	82	83.8	Calm.
	8 "	104	93	77.1	Dead calm.
	11 "	59	97	73.8	" "
7-7-33	2 a.m.	126	98	71.5	Heavy mist.
	5 "	14	98	71.5	Gentle breeze.
	8 "	2	89	77.8	Fresh breezes.
	11 "	94	66	86.5	Fresh breezes, rain.
	2 p.m.	65	69	89.0	Strong wind.
	5 "	90	84	80.2	Fresh breezes.
	8 "	628	95	75.2	Heavy mist, shower.
	11 "	44	98	73.7	Calm.
8-7-33	2 a.m.	7	99	72.9	Faint breeze.
	5 "	29	98	73.0	Foggy.
	8 "	27	92	76.7	Calm.
	11 "	5	75	84.5	Wind freshening.
	2 p.m.	53	92	76.3	Wind strong; heavy rain just commencing.
	72 hours.	2004 grains per 12 sq. inches.			

This shows an average deposit of pollen of 167 grains per square inch in three days, and indicates that there is probably a very great deal of wind-borne pollen throughout the estate.

It was originally planned that the further series of exposures of slides should be made at the Central Experimental Station, Serdang, during the same month, but unexpected pressure of work in another direction prevented this, and suitable opportunity was not found until the following November.

The oil palm area at Serdang is situated in the north west corner of the Experiment Station, very largely on the sides of ravines and slopes facing towards the south east and sheltered a good deal on the north west by its own disposition and by an extensive area of hilly jungle along the western boundary of the Experiment Station.

The site chosen was in the centre of the area devoted to experiments in artificial pollination, on the side of a small hill facing towards the east.

The first six slides were put out at 2 p.m. an the 20th November, 1933, and changed at intervals of three hours up to and including 11 a.m. on the 23rd.

Male inflorescences in various stages of flowering were noted on palms at the following distances from the palm on which the slides were hung:— 30 feet W.N.W., 100 feet N, 110 feet E, 140 feet N.N.E., 190 feet N.N.E., 215 feet N.N.W., 170 feet N.N.W., 195 feet S, 140 feet S.W., 200 feet W.S.W., 195 feet N.N.E., 170 feet N.N.E. and 110 feet N.

The "counts" of pollen obtained are as follows:—

Date.	Hour (Suntime)	No. of Pollen grains. (On 12 square inches.)	Humidity. per cent.	Temp. °F.	Weather Observations.
20-11-33	2 p.m.	—	74	86.5	Air faintly stirring.
	5 "	18	83	82.2	Wind freshening.
	8 "	233	93	75.0	Light showers of rain.
	11 "	88	99	74.2	Gentle rain.
21-11-33	2 a.m.	34	97	73.5	Fine and calm.
	5 "	40	97	72.8	Dead calm.
	8 "	8	95	74.0	Gentle breezes.
	11 "	40	75	83.8	Fine and bright.
	2 p.m.	68	78	83.5	Air almost still again.
	5 "	3	87	80.4	Gusty breezes.
	8 "	82	95	77.0	Dead calm.
	11 "	249	97	74.1	Light mist.
22-11-33	2 a.m.	108	97	73.5	Calm.
	5 "	8	98	72.8	Faint breeze.
	8 "	6	91	76.4	Just freshening.
	11 "	3	71	84.8	Gentle breezes.
	2 p.m.	8	66	86.5	" "
	5 "	147	93	78.0	" "
	8 "	62	97	73.5	Fairly heavy rain.
	11 "	26	100	72.3	Rain just over.
23-11-33	2 a.m.	38	99	72.5	Calm.
	5 "	2	99	72.5	Very
	8 "	3	90	75.8	gentle
	11 "	25	80	81.7	breezes.
	2 p.m.	6	81	79.5	Gusty wind.
	72 hours.	1305 grains per 12 sq. inches.			

This shows an average deposit of pollen of 109 grains per square inch in three days, which is an indication that a considerable amount of pollen is distributed by wind, and although the count is much lower than that obtained in the estate experiment, it would give the impression that there is adequate wind-borne pollen available for pollination of female inflorescences.

It is not intended to compare the results of these two single experiments at different times of the year, but it may be observed, that apart from the much higher total count obtained on the estate, which is largely accounted for by 628 grains for the period from 5 to 8 p.m. on the 7th July, 1933, the deposition of pollen was a good deal more evenly distributed than at Serdang.

This coincides with observations on the incidence of wind on each occasion for, on the estate, the wind, though generally of less strength, came in steadier gusts than at Serdang, where it reached the oil palm plantation in sudden gusty swirls.

Conclusions.

The results of these observations and experiments show that oil palms are, for all practical purposes, entirely wind-pollinated, and that although pollination by insects is not impossible, it is probably largely accidental and is never likely to be significant.

These experiments also give one reason to believe that, in estates and large plantations of average palms, particularly those in which the palms are sufficiently well exposed to prevailing winds, naturally wind-borne pollen is likely to provide the optimum pollination of female flowers.

The effects of artificial pollination on young palms require further study.

On account of its short stem, the dense crown of leaves typical of a young oil-palm forms an effective screen against wind-borne pollen, as a result of which its female inflorescences are but lightly pollinated.

Artificial pollination considerably increases the yields of fruit from young palms, (13) (14) (15) but there is some evidence to show that such assistance to fruit production in young palms may adversely affect their mature yields. (16) (17) (18). It is possible that the screen of leaves on a young palm acts as a natural protection against over-pollination.

The requirements of stands of specially selected palms and the possibilities in conjunction with manuring and cultivation have also to be examined more fully.

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WEEKLY FAIRS IN KEDAH

BY

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It is only logical that in any country the indigenous population should have some interest in the business which goes on in it; yet in Malaya an outsider on his first arrival would be greatly struck by the peculiar conditions which he meets. Almost all branches of business in the towns, from the management of the firms down to the insignificant odd jobs, are in the hands of people not of Malay blood. In short, there are indeed very few local business undertakings in which the Malays have any share.

The Malays and Commercial Development.

The process of dispersion of Malays from the settlement begins when it is still a village. As soon as a village attains sufficient importance to attract people of other races to start business, the Malays, instead of assisting in the work of betterment and uplift of local conditions, withdraw to quieter places where they can settle. In doing so they have often to start afresh by reclaiming or bringing under cultivation new areas of swamp or jungle.

It would be reasonable to suppose that the Malays would have been the first to profit by the rise of a village and the increased value of the land which they owned, and to have taken advantage of the situation by building a shop, or two, on their land and setting up their own businesses. The reason why they do not do this is obvious; they have no business training and cannot hope to compete with the new-comers, many of whom already possess commerical experience.

Many of these immigrants have business connexions elsewhere in Malaya as well as in their own countries, so that they are better able to arrange for the importation of foreign articles which are in local demand. Further, many of these people have experienced hardship and poverty in their own countries and have been trained to run their businesses along economical and profitable lines.

In their gradual retreat from the towns the Malays have brought under cultivation more and more areas of jungle and swamp. They have planted fruit and other useful trees in the former and wet-rice in the latter. On their return to the land they can find sufficient means to support themselves and their families; it is only when they have surplus quantities of produce that they find themselves faced with a problem.

It is evident that home industries are threatened with total extinction unless means can be found to stimulate production. At one time even the clothes which a Malay wore and several other articles which he carried about with him

were manufactured locally. Today many of the former home-made goods are not to be found, or are difficult to obtain.

As in many other countries, it would be almost a practical impossibility to try and revive home industries on a commercial scale against such heavy odds as the Malays are now facing in the shape of cheap machine-made articles.

With limited markets and in isolated units, Malay commercial enterprise is liable to fall an easy prey to other business bodies. In addition, the Malays have a curious desultory and spasmodic habit of conducting their businesses compared with the more tenacious and laborious methods of immigrant races. They may also change from one business to another, when they observe, or even imagine, that there is appreciably more profit to be gained by the latter and they seldom if ever stop to think of the consequences of over-production. An example of this was found at one fair, when on one occasion fourteen animals were killed for sale, where the average demand was six animals per week.

There is still a great deal to be done to avoid undue local competition and uneven distribution of produce, as the law of supply and demand is not properly understood by the people. At the same time, it would be against all the principles of the present movement to discourage local production where it is possible to arrange for supplies to be distributed evenly over a wider field.

The Work of the Weekly Fairs Committee.

The marketing of surplus production is one of the problems which is engaging the attention of the Weekly Fairs Committee appointed in 1932. This is a small official committee whose duties are to organise, manage and supervise weekly fairs throughout the State of Kedah.

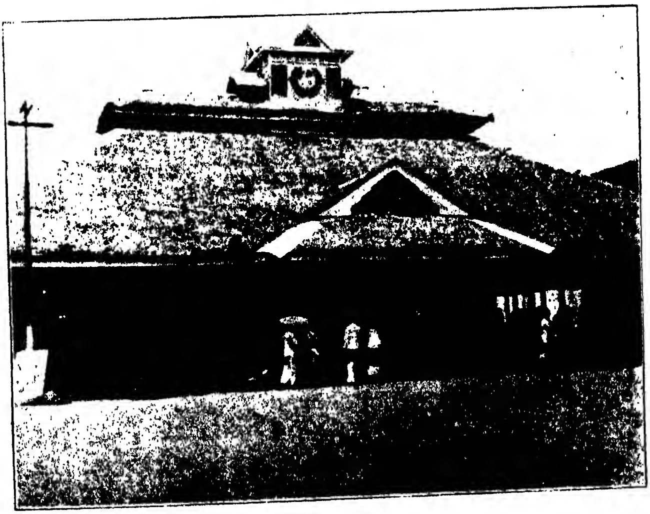
Weekly fairs were started about ten years ago but, mainly through lack of organisation, they enjoyed no long success. The three fairs which survived were taken over by the Committee, many old fairs were revived and new ones opened. All are conducted on a uniform system.

Although the power vested in the Committee is as stated above, it is chiefly concerned with general organisation and management. It fixes rules and regulations in regard to locality and sites, days on which fairs are to be held, conditions of sale, slaughter of animals for meat, designs of the buildings, charges for stalls, the allotment of the reserve funds, auditing of accounts kept at each centre, and the organisation of animal shows and the weekly fair at Alor Star.

Organisation of the Fair.

The cost of the building of each of the fairs in Kedah, except the main central fair at Alor Star, is financed by one or more persons who reside in the locality in which the fair is situated. If the construction is undertaken by one man he is free to run the fair in any way he prefers as regards the funds allotted to him, but he is still bound by the rules which apply to weekly collections from persons using the fair.

A WEEKLY FAIR DIRECTION POST IN KEDAH.



THE WEEKLY FAIR AT ALOR STAR, KEDAH.

The sites generally approved for the fairs are accessible by road, river, or by sea. Wherever possible, Government land is selected, but often in important localities, Government land is unobtainable, so that privately-owned land is rented on agreement for as long a term of years as possible.

Sometimes the fairs are located in the interior mukims approachable only by foot-paths. In these cases, the sites chosen are the first points touched by the peasants on reaching a main road, or cross-roads, for if the peasants have to pass a wayside shop, or shops, before reaching a fair, the articles they bring may be sold en route.

Near a big town the site chosen is often between the village with the biggest agricultural population and the town. This is essential to prevent the peasants from being intercepted by tradesmen and the produce sold at a smaller price than would have been obtained at the fair.

The days on which the fairs are to be held are fixed by the Committee and are arranged so that any two fairs taking place on the same day are far enough apart to avoid clashing. The shortest distance apart at which two fairs could be economically held on the same days is 10 to 12 miles.

An interval of two or more days is considered necessary for the holding of two closely connected fairs in order to give time to the sellers to collect materials for each.

It has been found necessary to regulate the sale of produce in the fairs in order to eliminate undue competition. This may appear to be an unprogressive course. At the present stage of development the whole organisation depends for its success on a certain amount of protection. The Malays, as has already been shewn, are still in the transition stage of business training and any discouragement due to unregulated competition would completely upset the objects of the scheme which the Committee has set itself to work out.

Among the articles for sale at most fairs are rice, cakes, ghee, wild honey, fruits and vegetables in season, agricultural implements, domestic goods and wild animals. There are about fifteen different articles of which the Malays have an absolute monopoly of sale at the fairs.

Owing to the excessive number of animals slaughtered and the consequent lowering of prices of meat, it has been found necessary to regulate the number of animals to be slaughtered at each fair. In this connexion the Committee has laid down regulations regarding slaughtering, which include supervision of slaughter, number of cattle to be slaughtered—decided by priority of applications—and inspection of animals before slaughter. Only persons residing in the vicinity of a fair are allowed to slaughter animals for sale at that fair.

Designs of the buildings vary slightly in different places according to the amount of capital and materials available, but on the whole the main buildings are constructed in very much the same manner. They are long and spacious sheds having double-span roofs, with a wide space between the first and the second roof to provide ventilation, and supported on high posts.

The stalls within are in rows, one along each side and one through the middle, and extend from end to end of the building. The gangways are sufficiently wide to enable a fairly large number of people to transact their business comfortably, or take shelter in rainy weather.

Other buildings consist of one large shed for women-sellers of vegetables, fruits, cakes, etc., and several small separate sheds and stalls, where ice, sherbert, coffee and food of the usual kinds common to the Peninsula are sold.

Charges up to thirty cents per person are imposed at each fair on all those who come to sell. Articles valued at less than 50 cents are allowed to be sold free of charge by both sexes, and articles up to $1 are allowed to be sold free of charge if they are brought for sale by women.

Capital.—The share-capital for the erection of the buildings at the fairs is collected among the local Malays. These people often supply all the building materials, such as timber and attaps, and construct the buildings themselves. The buildings are then assessed according to the value of the various materials used and the amount of labour employed.

Reserve Funds.—Out of the total weekly collection, the Committee insists on a certain percentage being set aside as a reserve fund for the purpose of meeting possible liabilities. The remainder, after deducting all expenses, is declared as a dividend and paid to the shareholders.

Accounts and Audit.—The account books of the fairs, which are in the Arabic character, are kept on a uniform system as approved by the Registrar of Co-operative Societies, who is for the time being, the auditor.

Organisation of Annual Shows and the Weekly Fair in Alor Star.

The first annual show was held in Alor Star in April 1933 and was considered a great success. Owing to financial considerations no show was held in 1934 though it is hoped to arrange for another show to take place at Sungei Patani in the near future.

The Weekly Fair at Tanjong Charlie, Alor Star.

The Tanjong Charlie Fair is maintained by the Government and is under the direct supervision of the Committee.

The fair is assisted by the Penghulu of Kota Star, a caretaker and four assistants who are engaged for the number of days the fair is held in each month.

The primary object was to ascertain how a fair consisting mostly of Malay business men and women would succeed in the town and how they would succeed in competition with the business population.

The Committee held out so little hope of success that it would not even countenance the idea of spending any money on the construction of a shed. What little shelter was available was supplied by an abandoned cattle quarantine shed which was barely sufficient to give protection for more than three lorry-loads of vegetables and fruits.

After two or three weeks' trial, the Committee felt convinced that the fair would succeed and a temporary attap roof was hurriedly constructed to cover the open quarantine yard.

From this time onwards the fair gradually increased in size and importance till it reached its present magnitude. Now, more than seventy bus-loads of fruit, vegetables and other produce come to the fair every Wednesday. In addition, there are a number of sellers who come on bicycles, in motor-cars, or boats and on foot. The turnover, per week, averages about $1,800.

The weely attendance, at a moderate estimate, is between 2,000 and 2,500, and the number of people who come to sell is about 400.

At this fair, only Malays are allowed to sell and, even with this strict condition, the buildings are not large enough for the requirements.

The Tanjong Charlie Fair, or Pekan Rabu, as it is generally known, is intended to be a training centre for other weekly-fairs. The Malays there are taught the use of scales, the use of weights and measures, proper arrangement and display of their merchandise in a manner attractive to the customer. Strict rules are enforced to ensure cleanliness of the buildings and of the articles brought for sale. There is also ample opportunity for new arrivals to learn to sell things at a profit and in a business-like manner.

It may be added that the chief business deficiency among the Malay peasants is their inability to make simple mental calculations and to determine the face-values of most articles they sell; in very many cases the articles are under-valued.

Permanent stall-holders at this fair include sellers of spices, fruits and vegetables, cigarettes and tobacco, Malay medicine, carpentry, pottery, preserves and padi-planting implements. Other stall-holders include a watch repairer, a bookseller, in addition to several eating shops.

General Work of the Committee.

Additional activities of the Committee are mainly concerned with propaganda, with the object of increasing the popularity of the fairs, by lectures, erection of sign posts, advertising fairs by posters and pamphlets and demonstration of methods of cultivation of vegetables.

In lecturing to the people the Chairman often speaks on suitable agricultural subjects with special reference to the work of the weekly fairs; the Registrar of Co-operative Societies lectures chiefly on economic subjects.

Sign-boards are placed at all suitable places, such as the junctions of roads and at the central weekly fair at Tanjong Charlie; at this fair a large board over 20 feet high bears a complete list of the weekly fairs established in the State. Sign-boards giving the names of the fairs, and the days of the week on which they are held, are placed at the sides of the roads a few hundred feet from all approaches to the fairs. The descriptions given are in three languages, namely, Malay, Chinese and Hindustani. On the top of each board is mounted a traffic danger signal.

Advertisement posters are circulated to all the fairs when there is any occasion for doing so. Circulars, with an up-to-date list of all the fairs, are printed and distributed free to the people from time to time.

Owing to general illiteracy, especially among the female peasant population, the Committee considers it advisable to use a distinguishing sign by which the fairs can be easily recognised. The design adopted is in the form of a crest, which bears a "tajak" and a "changkol", surrounded by a wreath representing "sireh" leaves. The weekly fair sign is mounted over all flag-posts and sign-boards.

Demonstration plots are attached to the big fairs where possible; the idea is to demonstrate to the people the best methods of cultivating different useful vegetables and money-crops.

By means of the weekly fairs the produce of the soil can be evenly and profitably spread over all parts of the State and sold either directly by the owners themselves at the fairs or indirectly through the Malay middlemen.

It is greatly to be hoped that when the fact is fully realised by the Malays that they are much behind other races in commerce and industry, it may lead them to the revival of these important branches of occupation in which they once took a prominent part. The number of fairs in the State, the attendance and the business turnover, give a clear indication of the business instinct awakening among them.

Extent of Progress.

The fact that there are now forty-two fairs in operation is an indication that they have become very much part of the life of the people. The average turnover per week is about $12,000. During the fruit season the turnover is larger, but this only lasts for about three or four months in the year. The total number of people who come to sell is about 3,000 per week. A fair percentage of these have taken up the business permanently, others are part-time sellers and those who wish to make the best use of their time between padi seasons.

The attendance, per week, at all the fairs is about 21,000. Of the total number of people attending, more than three-fourths are Malays. The fairs have come to be regarded by the Malays not only as places in which business is transacted, but also as meeting places. In North Kedah, people living within a radius of 10 miles gladly come to the fairs on foot with things for sale. At the fairs various topics bearing on local problems are freely discussed with officials and others.

Opportunities have been taken by Government officials to distribute medicine, to sell properties by public auction, to advertise shows, to display posters conveying useful information in relation to food and hygiene, and to announce by means of notices the latest developments in Government policy affecting the people.

The advantages derived from these fairs can be seen in many directions. More and more immigrant races have left and a large number of Malays have

come forward to do the work themselves; an improved market has been found for many products; fruit growing has gained in popularity; and passenger traffic has increased.

While there may be other advantages gained by the establishment of weekly fairs, the final aim in establishing them, as previously mentioned, is to teach the Malay people the importance of trade and industry. Some may lose money in the beginning, but such losses should not be large enough to discourage them, because the business only entails the investment of small capital. A loss, on the other hand, would serve to teach them to be careful, thrifty and more business-like. Success, however, would serve to eradicate the deep-seated conservatism respecting shop-keeping industry and commerce.

The fairs have received much assistance from many Government Departments. On the other hand, these events have been made use of by Government and have greatly facilitated the collection of taxes.

Summary and Conclusions.

In a little over two years, weekly fairs in Kedah have increased from three to forty-two. This has been achieved through the Committee appointed to organise this work. This Committee has regulated the whole conduct of the fairs, but has allowed the control to rest with those who finance the ventures.

The conclusion is reached that where the Malay population is in the majority and where padi fields, fruit orchards and Malay homesteads are large and numerous, weekly fairs are a natural and essential adjunct as they form centres in which the Malays can sell their surplus produce and buy in return, at reasonable prices, articles for their home needs.

In places in the southern districts, where there are fewer Malays in proportion to other nationalities, fairs are not of the same importance as they are in the north. In spite of this fact, fairs have become permanently and successfully established.

It is most encouraging to note that there is at present every indication of gradual business and commercial awakening among the Malays. The consciousness of the fact that they are at present far behind other people in this direction may be instrumental in bringing about a general revival of trade and commerce among them.

Acknowledgment.

The writer is much indebted to Mr. W. N. Sands, the Principal Agricultural Officer, Kedah, for his kind help and criticism in the preparation of this article.

MALAYA AT THE CANADIAN NATIONAL EXHIBITION, TORONTO, 1934.*

This year marked the Centenary of the City of Toronto, for which reason the Exhibition was more widely advertised and had many special features and attractions. The attendance shewed an increase of about 88,000 over last year's figures.

The Malayan stand, in a commanding position, occupied 640 square feet as compared with 384 square feet in the previous year. The main portion of the stand was devoted exclusively to pineapple propaganda, the chief purpose of Malaya's participation, but one end was set apart for tourist propaganda.

Pineapple cookery demonstrations were given thrice daily and attracted eager audiences. Considerable attention to the Malayan stand was given by the Press. In addition, the Publicity Officer delivered two National broadcasts on Malaya, in each of which reference was made to the pineapple exhibits and demonstrations at the Exhibition.

The Malayan exhibits impressed upon the public that the Malayan canned pineapple represents the highest value for money on the Canadian fruit market. A still more important service which it was able to perform, however, was that of introducing for the first time "Choice" quality Malayan pineapple to the Canadian public. It should be mentioned that in Canada, "Choice" denotes what in England is known as "Golden" quality, the Canadian equivalent for G.A.Q. (Good Average Quality) being known as "Standard". Until now, Malayan pineapple has only been known in the "Standard" quality, selling at an average price of 10 cents gold in the stores, as compared with 20 to 25 cents gold per can obtainable for the Australian and South African brands and for Cuban pines packed in Canada. The Malayan stand was mainly instrumental in getting this new Malayan quality firmly established.

"Standard" quality Malayan canned pineapple is entirely a price proposition on the Canadian market. That is to say, it holds its enviable position simply because it is cheap, and until recently, there has been little attempt made to extol it as having any particular merits in point of quality. Now that the quality has definitely improved under the stricter supervision introduced, there is a tendency to advertise it as a good quality article at a cheap price. Nevertheless, under present conditions it must still be considered as commanding its market simply because it falls within reach of the less affluent classes. Indeed, its very cheapness operates against it in the minds of many housewives able to afford the Australian or South African article; they refuse to buy Malayan pineapple simply because they cannot believe that the contents of a 10 cents can could possibly be up to the mark.

Palm Oil.

A small exhibit of Malayan palm oil products was displayed on the stand. It aroused considerable interest, and led to the introduction of this product to at least one important firm who wish to develop the trade in Canada.

* The following is abridged from the report of the Publicity Officer from the Malayan Information Agency, London, who was in charge of the Malayan Stand at the Exhibition.

Reviews.

Malayan Agricultural Statistics 1933.

By D. H. Grist. Special Bulletin, Economic Series No. 5, Department of Agriculture, S.S. and F.M.S. 1934. Price 50 cents (Straits Currency).

This is a compilation of statistics, drawn from various sources, concerning Malayan agriculture in the year 1933. It includes import and export figures for some years past of agricultural products which might be grown locally, areas and production of the principal agricultural crops, market prices in 1933 and meteorological data.

The present is the third year of publication of this annual statistical summary. Its scope has been widened with each successive issue; the first contained 63 tables, whereas the present number has 82 tables, two graphs and a comprehensive index.

Notes on Hymenopterous Parasites of Padi Pests in Malaya.

By H. T. Pagden. Special Bulletin, Scientific Series No. 15, Department of Agriculture, Straits Settlements and Federated Malay States; 1934. Price 50 cents (Straits Currency).

In this paper, Mr. H. T. Pagden, formerly Assistant Entomologist, Department of Agriculture, S. S. and F.M.S., records two Dryinids, *Pseudogonatopus hospes* Perk. and *Haplogonatopus* sp. near *americanus*, a Mymarid, *Paranagrus optabilis* Perk. and a Trichogrammid, *Oligosita* sp. as parasites of *Sogata furcifera* Horv. He describes the method of attack of the two Dryinids and gives notes as to the stage of host attacked, frequency of attack and parthenogenesis which in these species "appears to be the rule rather than the exception". He also records three hyperparasites from the cocoons of both the species of Dryinids. With regard to *Paranagrus optabilis* Perk. and *Oligosita* sp., he experienced considerable difficulty in determining their true host but finally established them to be parasites of the eggs of *Sogata furcifera*. In addition to the above mentioned, an unidentified parasite from the pupa and five egg parasites of *Schœnobius* are recorded, and one, *Phanurus beneficiens* Zehnt. he discusses in some detail. The development of its larva is described and illustrated and he suggests that the mandible-like appendages which Berlese calls antennae are of use to the larva in destroying possible competitors, since "if an egg of *Schœnobius* or *Diatræa* is exposed to attack by *Trichogramma* and later exposed to *Phanurus*, it is always the *Phanurus* which survives". Of the parasites mentioned in this paper, *Phanurus beneficiens* Zehnt. is considered the most important of *Schœnobius*, and *Paranagrus optabilis* Perk. of *Sogata*.

Mr. H. T. Pagden, who has been seconded for service in the Solomon Islands, was only able to make "random observations" on these insects, since his work in Malaya particularly concerned the control of lepidopterous stem borers of padi by means of the mass production of *Trichogramma japonica* Ashm. Nevertheless, these random observations are of decided interest and a useful contribution to the literature of the hymenopterous parasites of *Sogata* and *Schœnobius*.

G. H. C.

DISTRICT AGRICULTURAL SHOW.

Kuang, Selangor.

The second show at this centre was held at the Malay School on 4th November 1934. It was opened by the Hon'ble the British Resident, Selangor.

The number of exhibits in most classes was very satisfactory, though in many instances the quality left much to be desired.

Educationally, the event was a success. Exhibitors were able to see the improvements which they can make in preparing their agricultural products for market. Demonstrations were held and special exhibits staged by Government Departments which had for their purpose the improvement of hygiene in the villages, the housing and feeding of poultry, the preparation of improved rubber, and the advantages of co-operation in agriculture.

A baby show was held at which a demonstration in midwifery was given; nursing and feeding the child were also demonstrated.

ERRATA.

Experiments on the Cultivation and Manuring of Coconuts.

(*Malayan Agricultural Journal* Vol. XXII, No. 11, 1934).

Table IV.

Estate A.

1932	Nuts per palm	*read*	cover buried ...	47.0
			clean weeded and cultivated ...	48.8
			clean weeded only ...	48.8

Estate E.

1933	Nuts per palm	*read*	cover buried ...	64.8
			clean weeded and cultivated ...	76.8
			clean weeded only ...	75.0
			L N P K ...	75.0

Estate F.

First half 1934	Nuts per palm	*read*	cover slashed ...	22.4

Estate G.

First half 1934	Percentage	*read*	clean weeded only ...	112.1

Table V.

Estate B.

Nuts per palm	*read*	cover buried ...	6.5
		clean weeded and cultivated ...	11.1
		clean weeded only ...	10.4

Estate D.

Pounds per palm	*read*	clean weeded ...	33.5

Estate E.

Pounds per palm	*read*	L N P K ...	40.5

Estate F.

No. of nuts percentage	*read*	N P K ...	100.3

Estate G.

Nuts per palm	*read*	control ...	13.5

Table VI.

1931	Nuts per palm	*read*	control cover slashed ...	9.4
			clean weeded ...	17.1
First half 1934		*read*	lime, cover slashed percentage ...	49.3

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports submitted by Field Officers.

The Weather.

With the exception of parts of Kedah, where heavy rains early in the month gave way to hot dry conditions, the central areas of Perak and Negri Sembilan, the inland and south coastal districts of Selangor, and the central districts of Johore, where conditions were very dry, average precipitations were recorded. Appreciable flood damage was reported from Kedah and the riverine mukims of Lower Perak, while minor flooding occurred in practically all districts in Province Wellesley North and Penang, and to a lesser degree in the coastal and southern districts of Pahang.

Remarks on Crops.

Rubber.—A general price decline has been reported from all centres. In Kelantan the discrimination is mainly against the better qualities, and increased attention is therefore being given to the manufacture of lump.

Excessive rains which were general throughout the Peninsula appreciably restricted production by limiting the operations of tapping and collection. Inundation of holdings has been reported from the northern areas of Perak, and the west coastal areas of Johore.

Favourable conditions have assisted the distribution and spread of mouldy rot disease. The departmental sales of approved fungicides have been maintained, and an endeavour to stimulate voluntary control in centres where the disease has become virulent has been made by staging demonstrations of approved methods of treatment. There is, unfortunately, a strong feeling among a large body of small-holders that heavy rains neutralise the effect of fungicides.

Improvements in the general upkeep of small holdings continue to be maintained, and in many cases the manufacture of better quality rubber is reported. These improvements are due, in a large measure, to the instructional work carried out by the officers of the Small-holders' Advisory Service.

Padi.—Planting in the Krian Irrigation area this season is computed at approximately 48,397 acres as compared with 49,060 for the previous season. Flowering has commenced in several centres and the gradual withdrawal of water supplies from fields is expected to commence early in December. Insect pests have caused but slight damage, while depredations by rats—although on the increase during the period under review—have been of no particular consequence. It is reported that an increased measure of control has been general throughout the district. Crop prospects generally are very good.

Crop destruction due to flood damage in Kedah is estimated at about 2,840 acres, Kubang Pasir and Kota Star Districts being principally affected. The

Muda river broke through the bund at Pekula and submerged a large area of crop and destroyed approximately 248 acres. Lesser floodings were also reported from Province Wellesley North, and in the coastal and southern areas of Pahang. In the riverine mukims of Lower Perak District, many of the areas under cultivation were submerged continuously for some three weeks.

Harvesting has commenced in the Jelebu and Kuala Pilah Districts of Negri Sembilan, and in the riverine and coastal mukims of Pahang and parts of Selangor. The irregularity of planting has resulted in considerable bird damage.

In the newly-opened areas of Sungei Manik, Perak, planting has been continued and good growth has been reported in the earlier planted centres. At Panchang Bedina in Selangor, water supplies are now adequate but planting material is limited, due to earlier water shortage, and pest damage in nurseries.

In Kelantan, planting is practically completed and the crop is making good progress. The dry padi crop did not recover from the set-back experienced in the early stages of growth and yields will suffer in consequence.

Coconuts and Copra.—A smaller demand for fresh nuts in the Burma markets declined the nut price to $13 per thousand. The competition by middlemen in this trade continues to be keen.

The copra produced on the improved kiln at Sri Menanti, Johore, is now being sold locally at a satisfactory price. The second improved kiln erected at Ringgit, Batu Pahat, was opened during the month and commenced operations. Arrangements are in hand for the erection of kilns of similar type at Serkat and Ayer Baloi.

In Perak South, the kiln at Sungei Nipah commenced working and produced good quality copra which obtained a satisfactory price. Another small-holders' kiln at Sungei Balai is preparing to restart with a view to producing good quality dry copra. Advisory visits to a number of other kilns with the object of effecting improvements have been maintained.

Patchouli.—With an increase in price for dried leaves, attention has been paid to the harvesting of areas which have been in a state of abandonment for some considerable time in the Segamat District of Johore.

Pineapples.—Prevailing weather conditions appear to be responsible for retarding the ripening of fruit which is very scarce in Johore and Singapore. In the former State, four factories commenced operations during the month but closed down owing to short supplies.

Agricultural Stations.

The demonstration plot for Sakai at Anak Ayer Denak in Perak has been cleared and fenced. The planting of fruit trees will be undertaken as soon as supplies are available.

On most stations tea pruning has been completed and the bushes dressed with the standard pruning mixture. Owing to the incidence of this operation

the yield of made tea at the Experimental Station, Tanah Rata, declined to 1651 pounds during the month.

Further progress with the development of stations in Labuan and Brunei has been reported.

Padi Stations and Test Plots.

At Telok Chengai Experiment Station and the four test stations in Kedah, very satisfactory progress has been made by the crop which has completely recovered from the severe flooding previously experienced. A number of the earlier strains have commenced to flower and an excellent harvest is anticipated.

At Titi Serong Experiment Station and the mukim test plots in Krian, conditions are equally satisfactory. Water supplies are adequate and pest damage only slight.

At the new Sungei Manik Station developmental work is making progress and it is anticipated that stumping and burning will be completed by the end of the year. Severe flooding has necessitated arrangements for raising earthworks three feet above ground level to accommodate with safety the store and quarters.

At Talang, the Hong Kong variety Lam Shum Tsim was harvested during the month; a considerable loss of grain was suffered due to bird damage. The Sze Min variety is now nearing maturity: it has a longer maturation period, and would appear to be a heavier yielder than the former. The ripening in both cases is very uneven.

Of the newly opened plots in the Panchang Bedina area, flooding delayed transplanting at Tanjong Karang where seedlings were destroyed. At Panchang Bedina nurseries were successively destroyed by mole crickets during the early part of the season when conditions were dry, and later by floods. The third sowing is apparently successful. Cultivation and transplanting is in progress at Sungei Haji Durani where the Pentatomid bug *Scotinophara coarctata* and leaf-eating caterpillars did serious damage to nursery seedlings.

Bee-Keeping.

A supply of bee-keeping accessories was imported and hives of the small native bee (*Apis indica*) installed at departmental headquarters in Kedah, for observation and instructional purposes.

Mushroom Cultivation.

An edible fungus, which appears to be identical with the padi straw mushroom cultivated in China, the Netherlands Indies and Province Wellesley and described in the *Malayan Agricultural Journal*, Vol. XXII, No. 1, January 1931, was found to occur naturally in Kedah on heaps of padi straw following the prolonged rains of the past few months.

Poultry.

An outbreak of disease reported from Matang Gerdu, Briah, in Perak, towards the end of the month was promptly investigated by the Veterinary Inspector. The outbreak, which was thought to be Diptheritic-stomoto-pharyngitis was confined to one flock only. Material for examination was despatched to the veterinary authorities and the Institute for Medical Research.

Outbreaks were also reported from the Lipis District of Pahang, and the Pontian, Endau and Kukup Districts of Johore.

Models of poultry houses and accessories have been received in all centres. These will serve for demonstration purposes in conjunction with itinerant lectures on poultry management.

Rice Mill Temerloh.

The mill buildings and machinery assembly are nearing completion, and it is expected that trial operations will be undertaken early in December.

The District Officer, Temerloh, the State Agricultural Officer, Pahang, and the Malay Agricultural Assistant, Pahang South, paid a visit to the Government Rice Mill, Bagan Serai, during the month to observe the methods of large-scale milling.

School, Home Garden, and Kampong Competitions.

The second preliminary judging of school gardens in Krian and Selama, Perak was carried out during the month and the final judging will be completed before the commencement of Mohamedan fasting month, early in December.

The final judging of school gardens in Pahang East was completed during the month, the standard attained being very satisfactory.

There has been a wide response to the home garden competition now being held in the Selama sub-district, Perak. Many scholars, particularly in Tebing Tinggi and Ijok have entered. The first judging is now in progress.

In Pahang, judging in kampong and home garden competitions is practically completed. The standard is reported to be higher than that of the previous year. In the Pekan District 57 gardens competed, the prize being won by a Kuala Pahang entrant who obtained 90 per cent. of the total marks.

District Padi Competition.

The first competition of this kind to be held at Batu Pahat, Johore, took place on November 15th : 269 samples were entered, the best five being retained for participation in a State Competition where selections will be made to represent the State in the All-Malayan Competition, held in conjunction with the Malayan Exhibition in 1935. Requirements for show standards were explained and demonstrated.

Agricultural Shows.

The second Mukim Agricultural Show was held at the Malay vernacular school, Kuang, on November 4th.

All sections were well represented, the exhibits in many cases being of excellent quality. The outstanding feature of the show was the number and quality of exhibits in the poultry sections.

DEPARTMENTAL NOTES.

Change of Title.

It is notified for general information that, with the approval of the Right Honourable the Secretary of State for the Colonies, the title of the appointment of Director of Agriculture, Straits Settlements and Federated Malay States, has been changed to Director of Agriculture, Straits Settlements and Advisor on Agriculture, Malay States. (No. 5551 *F.M.S. Government Gazette* November 30th 1934).

Tour of Director of Agriculture.

The Acting Director of Agriculture visited Fraser's Hill between 11th and 13th November for the purpose of inspecting the Dairy Farm at Jeriau.

Visit of Officer-in-Charge of Copra Investigations to the Philippine Islands.

Mr. F. C. Cooke, Officer-in-Charge of Copra Investigations, who left for the Philippine Islands on October 16th, returned on December 5th.

All aspects of the coconut industry were discussed and views on the economic problems of that industry were exchanged with officials of the Department of Agriculture and Commerce and with leading merchants to whom introductions were effected through the courtesy of His Britannic Majesty's Consul-General, Mr. Thomas Harrington.

Later Mr. Cooke and Mr. F. Gallang, Senior Agronomist of the Bureau of Plant Industry, paid a visit to the largest single area of coconuts in the Philippine Islands which is to be found in Southern Luzon.

Subsequently, coconut areas in Mindoro, Romblon, Cebu, Bohol, Zamboanga and Davao were similarly inspected, introductions being effected through the courtesy of His Britannic Majesty's acting Vice-Consuls at Cebu, Zamboanga and Davao respectively and the Director of the Bureau of Plant Industry at Manila.

Leave.

Mr. B. A. Lowe, Agricultural Officer, has been granted 8 months and 3 days full-pay leave from 23rd November 1934 to 25th July 1935 inclusive.

Statistical.

MARKET PRICES.

November 1934.

Rubber.—The price of rubber weakened still further during November, the lowest quotation being 20 cents per lb. The commodity opened at $21\frac{3}{4}$ cents per lb. for spot loose in Singapore and closed at $21\frac{3}{8}$ cents, but the average price for the month was only 20.93 cents per lb. for Smoked Sheet equal to London Standard, as compared with 22.76 cents per lb. in October. The average price for November in London was 6.29 pence per lb. and in New York 12.91 cents gold per lb. as compared with 6.75 pence and 13.78 cents gold respectively in October.

Weekly prices paid during the month for small-holders' rubber at three centres are shewn in the following table.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, November, 1934.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.					Kuala Kangsar, Perak.				Batu Pahat, Johore.			
	1	8	15	22	29	7	14	21	28	7	14	21	28
Smoked sheet		23.16	24.00	22.70	24.17	23.30	24.28	23.25	24.00	22.60			21.60
Unsmoked sheet	22.13	22.30	21.63	21.28	21.78	20.22	20.10	20.51	21.40	20.50	21.00	20.51	20.60
Scrap			13.00	13.44	13.50			13.00					

Transport by lorry Kuala Pilah to Seremban 15 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway \$10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.

Palm Oil.—The following prices for the local commodity were quoted during the month.

Table II.

Date 1934.	Palm Oil in Bulk, c i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
Nov. 2	£13.15.0	£ 6. 7. 6
„ 9	14. 0.0	6. 7. 6
„ 16	13.15.0	6. 5. 0
„ 23	14.10.0	6. 7. 6

Copra.—Prices in Singapore during November shewed little variation, but towards the close of the month, values shewed some small appreciation, and the mixed quality maintained its high value in relation to the sun-dried grade. The latter grade opened at $2.95 per picul and closed at $3.05, averaging $2.95 per picul for the month, as compared with $3.01 in October. The mixed quality averaged $2.70 per picul as compared with $2.52 in October.

Copra cake was quoted throughout the month at $1.70 per picul.

Rice.—The average wholesale prices of rice per picul in Singapore during October were as follows:—Siam No. 2 (ordinary) $3.14, Rangoon No. 1 $3.15, Saigon No. 1 (long grain) $3.05, as compared with $3.39, $3.30 and $3.30 in September. Corresponding prices in October 1933 were $3.48, $2.87 and $3.12 respectively.

The average retail market prices in cents per gantang of No. 2 Siam rice in October were:—Singapore 26, Penang 25, Malacca 24, as compared with 26, 25 and 26 respectively in September.

The average declared trade value of imports of rice in October was $3.36 per picul, as compared with $3.38 in September and $3.03 in August.

Padi.—The price paid for padi at the Government Rice Mill, Bagan Serai continued at $1.50 per picul. A privately-owned mill paid $1.30 per picul.

Tea.—Bigia (Kedah) tea was quoted at 10¾d. per lb. in London during October.

Average London prices per lb. for tea consignments from other countries were as follows:—Ceylon 1s. 2.25d., Java 10.08d., Indian Northern 1s. 0.82d., Indian Southern 11.5d., Sumatra 9.58d. Prices improved slightly at the commencement of the month, but weakened again at the close.

Tuba Root (*Derris*).—A much firmer note was prevailing in the Singapore market at the close of November. Continued wet weather is curtailing supplies

and, in expectation of higher prices in the new year, growers are not gathering roots. The average price in Singapore for roots sold on fair rotenone content remained unchanged at $40 per picul but the average for better qualities was $44 per picul. Roots sold on a basis of ether extract averaged $29 per picul during November as compared with $28 in October.

Gambier.—Singapore prices remained unchanged during November, quotations being $6.75 per picul for Block and $9.50 per picul for No. 1 Cube as compared with October average prices of $5.81 and $8.94 respectively.

Pineapples.—Very little business was passing during November and prices per case remained unchanged at: Cubes $3, Sliced Flat $2.85, Sliced Tall $3.25. October prices were $3.05, $3 and $3.25 respectively.

Average prices of fresh pineapple in Singapore was $2.50 per 100 for large fruits and $1.50 per 100 for small. Johore prices varied in districts from $1.20 to $3 per 100. Kedah prices were from $2 to $6 for Mauritius pines, and $7 to $10 per 100 for Sarawak pines.

Tapioca.—There was no change in Singapore prices during the month and quotations per picul were:—Flake Fair $3.50, Seed Pearl $5.50, Pearl Medium $5.85. October average prices were:—$3.45, $5.50 and $5.85 respectively.

Tobacco.—Local prices varied within a wide range according to quality. Perhaps a fair average is that reported from Perak where 1st quality was $30 to $50 per picul, 2nd quality $24 to $46 and 3rd quality $8 to $34. The price of fresh leaf was about $1.50 to $4 per picul.

Sago.—Prices in Singapore of Flour, Sarawak Fair, improved during November, averaging $2.16 per picul as compared with $2.03 in October, but Pearl, Small Fair weakened to average $3.72 per picul as compared with $3.90 in the previous month.

Mace.—Prices in Singapore continued unchanged during the month at the October level of $90 per picul for Siouw and $60 per picul for Amboina.

Nutmegs.—There was no change throughout the month in the Singapore prices of nutmegs which were $26 per picul for 110's and $27 per picul for 80's, as compared with $25 and $26 respectively in October.

Pepper.—Prices improved still further during November but eased a little at the close in sympathy with London. Average prices per picul in Singapore for the month were:—Singapore Black $21.25, Singapore White $62.25, Muntok White $64.25. The October average prices were $18.88, $55.50 and $57.38 respectively.

Cloves.—Prices in Singapore remained nominal at Zanzibar $35 and Amboina $45 per picul.

Coffee.—Prices of coffee in Singapore opened weakly but there was a slight improvement during the month. Sourabaya coffee opened at $17 to $18 per picul rising to $18 to $19.50. Palembang coffee opened at $12.75 per picul and closed at $13, an average for the month of $12.94 as compared with $12.44 in October.

Local prices of coffee appreciated over those ruling last month. Prices varied from $18 to $29 in different districts and according to quality.

Arecanuts.—Singapore average prices per picul in November were as follows:—Splits $4.87 to $6.25, Sliced $8 to $9.78, Red Whole $5.65 to $6.56, Sourabaya Whole $6.50 to $7.56. No prices were quoted for Bila Whole.

The average prices quoted by the Singapore Chamber of Commerce were:—Best $5.92, Medium $5.55, Mixed $5.14.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Mackay & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY*

October 1934.

Malaya.—Imports of foreign rice into Malaya during October were 53,018 tons and exports 20,300 tons, net imports accordingly being 32,718 tons. For the period January to October, 1934, net imports were 385,304 tons, an increase of 7.6 per cent.†

Of the imports during October, 59 per cent. were consigned to Singapore, 12 per cent. to Penang, 4 per cent. to Malacca, 16 per cent. to the Federated Malay States and 9 per cent. to the Unfederated Malay States. Of the total, 74 per cent. came from Siam, 24 per cent. from Burma, 1 per cent. from French Indo-China and 1 per cent. from other countries.

Of the exports during the month under review, 73 per cent. were shipped to the Netherlands Indies and 27 per cent. to other countries. The various kinds of rice exported were:—Siam 13,855 tons (68.2 per cent.), Burma 3,852 tons (19 per cent.), French Indo-China 523 tons (2.6 per cent.), India 1,962 tons (9.7 per cent.), local production 108 tons (0.5 per cent.).

India and Burma.—For the period January to September 1934, foreign exports totalled 1,194,000 tons, as compared with 1,564,000 tons in 1933, a decrease of 23.7 per cent.

Total exports of rice and bran for the period 1st January to 29th September 1934, amounted to 3,247,874 metric tons, an increase of 17.7 per cent. as compared with 2,759.983 metric tons in 1933.

According to the *Indian Trade Journal,* 25th October 1934, the total planted area was reported to be 75,261,000 acres, an increase of 0.2 per cent. as compared with the corresponding estimate of 75,080,000 acres for the season 1933-34. Weather conditions were not favourable but the condition of the crop in October appeared to be generally good.

Siam.—Exports of rice from Bangkok during September were 151,167 tons, making a total of 1,334,942 tons for the period January to September 1934, as compared with 1,231,077 tons in 1933.

The padi crop for the 1933-34 season was 4,967,980 tons, a decrease of 107,810 tons as compared with the previous season.

Japan.—According to the *Trans Pacific Journal,* 18th October 1934, the following are the estimated figures for supply and demand for the period November 1934 to October 1935.

Supply:	Production	7,391,300	tons.
	Balance 1933-34 rice year ...	2,244,040	„
	Imports	1,683,030	„
Demand:	Domestic consumption ...	9,817,670	„
	Exports	280,500	„

shewing a surplus of 1,220,200 tons.

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* Abridged from the Rice Summary for October, 1934, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1933.

The area for the second rice crop of Formosa was estimated to be 935,000 acres, a decrease of 26,137 acres as compared with the second crop of 1933. Production was estimated at 657,035 tons, an increase of 36,683 tons or 5.9 per cent. as compared with the second crop of 1933.

French Indo-China.—Entries of padi into Cholon, 1st January to 31st October 1934 totalled 1,360,720 metric tons, an increase of 38.8 per cent. as compared with 980,565 metric tons in 1933.

Exports of rice for the same period were 1,272,540 metric tons, as compared with 1,090,892 metric tons in 1933. An increase of 16.7 per cent.

Netherlands Indies.—The area under rice in Java and Madura harvested during the period January to August 1934, (*Economic Bulletin,* 1st November 1934) was 8,020,090 acres, as compared with 8,215,220 acres in 1933, a decrease of 2.4 per cent.

Imports of rice for this period were 126,349 metric tons, a decrease of 54.3 per cent. as compared with imports of 276,344 in 1933.

Ceylon.—Imports for the period January to October 1934, totalled 391,238 tons, an increase of 9.1 per cent. as compared with 358,626 tons in 1933.

Of the 1934 imports, 14.4 per cent. were from British India, 62 per cent. from Burma and 23.6 per cent. from other countries.

Europe and America.—Shipments from the East to Europe for the period 1st January to 25th October 1934, were 1,027,305 tons, as compared with 1,120,502 tons in 1933, a decrease of 8.3 per cent.

Of the 1934 shipments 37 per cent. were from Burma, 5 per cent. from Japan, 46 per cent. from Saigon, 10 per cent. from Siam and 2 per cent. from Bengal. The 1933 percentages were 49, 2, 41, 7, and 1 respectively.

Shipments to the Levant from the East for the period 1st January to 5th October, 1934, totalled 25,789 tons, an increase of 13.9 per cent. as compared with 22,639 tons in 1933.

Shipments to the West Indies and America for the period 1st January to 25th September, 1934, were 158,993 tons, as compared with 137,836 tons in 1933, an increase of 15.3 per cent.

MALAYAN AGRICULTURAL EXPORTS, OCTOBER, 1934.

PRODUCT.	Net Export in Tons.				
	Year 1933.	Jan.-Oct. 1933.	Jan.-Oct. 1934.	October 1933.	October 1934.
Arecanuts ...	20,756	17,733	15,386	2,803	817
Coconuts, fresh † ...	100,609†	86,401†	84,288†	7,947†	11,922†
Coconut oil ...	17,568	14,713	20,698	1,665	2,350
Copra ...	110,543	86,765	76,627	13,728	9,951
Gambier, all kinds ...	2,560	2,027	1,827	225	229
Oil cakes ...	9,992	8,373	9,777	757	1,522
Palm kernels ...	1,983	1,713	2,624	280	547
Palm oil ...	12,101	9,247	13,182	2,129	2,943
Pineapples canned ...	59,582	51,271	59,230	1,553	2,393
Rubber ¶ ...	459,836¶	372,787¶	385,956¶	41,409¶	34,075¶
Sago,—flour ...	7,648	3,787	6,631	1,182	1,071
„ —pearl ...	2,646	1,917	4,084	273	533
„ —raw ...	4,420*	3,482*	5,526*	412*	790*
Tapioca,—flake ...	9,881	8,691*	5,138	741	199
„ —flour ...	702*	182	1,656*	13	180*
„ —pearl ...	17,297	14,568	13,246	1,636	1,169
Tuba root ...	569½	399½	446½	56	24½

† hundreds in number. * net imports. ¶ production.

MALAYA RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 30TH OCTOBER. 1934.

State or Territory	Acreage of Tappable Rubber end 1933 (d)	Estates which have entirely ceased tapping		Estates which have partly ceased tapping (a)		Area of Tappable Rubber never been tapped		Total (3) + (5)	Percentage of (9) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STRAITS SETTLEMENTS :—									
Province Wellesley	44,285	1,129	2.5	7,412	16.7	609	1.4	8,541	19.2
Dindings	7,368	112	1.5	935	12.7	114	1.5	1,047	14.2
Malacca	121,152	485	.4	15,216	12.6	2,818	2.3	15,701	13.0
Penang Island	1,366	390	28.6	424	31.0	201	14.7	814	59.6
Singapore Island	28,842	2,820	9.7	4,751	16.5	495	1.7	7,571	26.2
Total S.S. ...	203,013	4,936	2.4	28,738	14.2	4,237	2.1	33,674	16.6
FEDERATED MALAY STATES :—									
Perak	253,227	4,403	1.7	34,751	13.7	13,884	5.5	39,154	15.4
Selangor	310,003	4,083	1.3	40,438	13.0	12,601	4.1	44,521	14.3
Negri Sembilan	233,592	4,981	2.1	33,258	14.2	18,654	8.0	38,239	16.3
Pahang	46,712	4,357	9.3	14,052	30.1	9,308	19.9	18,409	39.4
Total F.M.S. ...	843,534	17,824	2.1	122,499	14.5	54,447	6.5	140,323	16.6
UNFEDERATED MALAY STATES :—									
Johore	365,400	8,908	2.4	23,925	6.5	21,562	5.9	32,833	8.9
Kedah (b)	126,588	1,632	1.3	28,816	22.8	19,550	15.4	30,448	24.1
Kelantan	25,793	8,477	32.8	2,391	9.3	5,418	21.0	10,868	42.1
Trengganu (b)	4,543	Nil	Nil	98	2.2	98	2.2	98	2.2
Perlis (c)	1,181	Nil	Nil	266	22.5	266	22.5	266	22.5
Total U.M.S. ...	523,505	19,017	3.6	55,496	10.6	46,894	9.0	74,513	14.2
TOTAL MALAYA ...	1,570,052	41,777	2.7	206,733	13.1	105,578	6.7	248,510	15.8

Notes :—(*a*) Area out of tapping on Estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.
(*b*) Registered Companies only.
(*c*) Rendered quarterly.
(*d*) Figures are as reported by estate managers.

Stocks, Production, Imports and Exports of Rubber, including Latex, Concentrated Latex and Revertex, for the Month of October, 1934, in Dry Tons.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
								during the month		January to Oct. inclusive 1934		during the month		January to Oct. inclusive 1934				
	Ports	Dealer	Estates of 100 acres and over	during the month	January to Oct. inclusive 1934	during the month	January to Oct. inclusive 1934	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Malay States :—																		
Federated Malay States ...	...	13,189	9,546	12,986	119,040	5,498	85,359	Nil	Nil	Nil	Nil	13,241	5,847	148,102	67,667	...	12,402	9,721
Johore ...	...	3,081	2,796	3,923	37,453	2,545	43,178	Nil	124	Nil	396	1,741	6,360	16,483	66,663	...	1,759	2,609
Kedah ...	...	684	2,001	2,935	27,300	736	14,456	Nil	Nil	Nil	Nil	1,392	2,220	14,682	27,162	...	354	2,390
Perlis ...	...	23	18	17	136	11	288	Nil	Nil	Nil	Nil	Nil	33	Nil	431	...	21	15
Kelantan ...	...	211	281	283	2,540	496	6,637	Nil	Nil	319	Nil	177	682	980	8,522	...	242	170
Trengganu ...	...	55	50	189	2,253	95	1,124	Nil	Nil	Nil	Nil	Nil	284	Nil	3,377		55	50
Total Malay States	...	17,243	14,692	20,333	188,722	9,381	151,042	Nil	124	319	396	16,551	15,426	180,337	173,822	...	14,833	14,955
Straits Settlements :-																		
Malacca ...	...	3,162	976	1,630	14,070	1,314	23,298	Nil	13,854	4	161,621	3,459	Nil	32,573	Nil	...	3,338	1,075
Province Wellesley	...	1,504	443	618	5,749	90		Nil		Nil						...	1,623	543
Dindings ...	...	82	144	112	1,086	62		Nil		Nil		6,670		81,177		...	58	153
Penang ...	2,695	12,735	9	11	120	146		1,581		23,398						3,026	12,081	10
Singapore ...	7,431	42,170	174	217	1,869	161		8,645		163,948		20,365		272,559		7,327	42,074	193
Total Straits Settlements	10,126	59,653	1,746	2,588	22,894	1,773	23,298	10,226	13,854	187,350	161,621	30,494	Nil	386,309	Nil	10,353	59,174	1,974
Total Malaya	10,126	76,896	16,438	22,921	211,616	11,154	174,340	10,226	13,978	187,669	162,017	47,045	15,426	566,646	173,822	10,353	74,007	16,929

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
20	21	22	23	24	25	26
Dry Rubber	11,115	36,195	9,836	4,781	1,169	191
Wet Rubber	1,287	5,879	2,245	238	590	163
Total ...	12,402	42,074	12,081	5,019	1,759	354

TABLE III
FOREIGN EXPORTS

PORTS	For month	January to Oct. 1934
Singapore ...	80,601	378,748
Penang ...	11,114	125,737
Port Swettenham.	5,044	56,528
Malacca ...	286	5,633
Malaya ...	47,045	566,646

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January to Oct. 1934
Malay States ...	31,978	378,977
Straits Settlements	3,851	
Malaya ...	35,829	378,977

Notes :— 1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, *i.e.*, Column (9) = Columns [15] + [16] + [19] + [20] + [21] + [22] — [4] — [5] — [6] — [7] — [11] — [12]. For the Straits Settlements. Column [9]: figures for Singapore and Penang Islands represent sales or exports as shown by cess paid and for the mainland represent as previously purchases by dealers from local estates of less than 100 acres, reduced by 15 % to terms of dry rubber.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.

4. Column (31) represents domestic exports, being net exports from the mainland Labuan and Brunei, plus production as represented by sales or exports in the Islands of Singapore and Penang. Column (32) represents net exports in the absence of any means of calculating domestic exports of the Straits Settlements for the period January to May inclusive. Column (32) includes from June inclusive 145, 368 tons domestic exports of which 144,975 tons are debitable to quota under the Rubber Regulation Agreement dated 7th May, 1934, and 393 tons are exports not subject to regulation. (Figures may be subject to minor adjustment.)

5. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 24 November,

Locality.	Air Temperature in degrees Fahrenheit: Means of A. Max.	B. Min.	Mean of A and B.	Absolute Extremes: Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	Earth Temperature: At 1 foot	At 4 feet	Rainfall: Total		Most in a day. Amt.	Number of days: Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more	Bright Sunshine: Total.	Daily Mean.	Per cent.
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						Hrs.	Hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	89.6	72.2	80.9	94	70	83	74	83.9	84.5	12.33	313.2	2.13	23	18	1	4		137.60	4.44	37
Bukit Jeram, Selangor ...	86.3	72.3	79.3	89	71	81	74	82.9	84.6	10.06	255.5	3.35	21	17		2		153.65	4.96	41
Sitiawan, Perak ...	88.3	73.0	80.7	91	71	85	75	83.7	84.8	5.50	139.7	1.10	16	11	1			161.10	5.20	43
Temerloh, Pahang ...	88.2	72.9	80.5	91	71	84	75	84.6	85.9	10.28	261.1	1.79	22	17	2	9		168.90	5.45	45
Kuala Lipis, Pahang ...	87.4	72.0	79.7	91	69	83	74	83.4	84.4	15.18	385.6	2.72	23	19	2	26		145.20	4.68	39
Kuala Pahang, Pahang ...	85.0	73.8	79.4	91	72	80	76	83.6	85.4	14.97	380.3	3.60	24	22				154.60	4.99	41
Kallang Aerodrome, S'pore ...	85.1	75.3	80.2	89	73	80	78	82.0	83.3	10.30	261.6	2.19	20	14	1			148.45	4.79	40
Butterworth, Province Wellesley ...	85.6	73.9	79.7	88	72	80	76	83.0	83.8	13.55	344.2	3.16	23	18	1			141.35	4.56	38
Bukit China, Malacca ...	83.8	73.7	78.7	87	71	81	76	82.5	83.5	11.20	284.5	1.96	20	19	1			134.40	4.34	36
Kluang, Johore ...	87.7	71.1	79.4	93	69	83	73	81.8	82.3	5.71	145.0	2.20	22	16		10		122.65	3.96	33
Bukit Lalang, Mersing, Johore	85.7	72.2	78.9	90	71	80	73	81.6	81.5	6.72	170.7	1.94	22	16	1	o		152.40	4.92	41
Alor Star, Kedah ...	86.5	73.8	80.1	90	72	79	76	84.6	85.1	23.70	602.0	3.15	27	23	7			151.50	4.89	41
Kota Bahru, Kelantan ...	86.8	73.8	80.3	90	72	77	75	84.2	84.9	15.91	404.1	4.01	22	19	1			161.90	5.22	43
Kuala Trengganu, Trengganu	85.6	72.9	79.3	90	71	77	75	82.6	84.2	13.47	342.1	2.19	25	23	2			153.80	4.96	41
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft. Pahang ...	73.2	62.2	67.7	77	60	69	64	71.0	71.7	16.03	407.2	2.00	24	22	7	6		105.75	3.41	28
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.6	57.9	64.7	74	54	68	61	70.5	70.0	14.96	380.0	1.76	29	27		1		104.10	3.36	28
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	70.3	59.2	64.7	74	57	66	60	—	—	14.59	370.6	1.77	27	25				103.85	3.35	28

Compiled from Returns supplied by the Meteorological Branch, Malaya

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